UNIVERSITY OF TWENTE.

Designing a persuasive mobile alcohol avoidance training by using persona-based design briefs

The development of a prototype
within a User-Centered Design approach

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Tactus verslavingszorg

Abstract

Background. Breindebaas is a smartphone app with the aim to break through the unconscious processes that maintain an alcohol addiction, by retraining automatic approach tendencies. A prior study showed low adherence, due to the repetitive nature of the training task which was experienced as boring. The primary aim of the current study is to design a persuasive prototype of the app that improves adherence and acceptability by professionals. The secondary aim is to study the impact of persona-based design briefs on the design process and prototypes, in which different presentation formats are compared.

Methods. In sub study A, semi-structured interviews were conducted with potential users (n=7) and professionals (n=5), with the aim of mapping out their needs, wishes and acceptance for adding persuasive (game) elements. The transcribed interviews were converted into user requirements. In sub study B, these requirements were used to create a persona-based design brief in two different formats. Two design teams were instructed to develop a persuasive prototype of the new app by using either a text-based design brief or a pictorial design brief. The impact of the persona-based design briefs on the prototypes and process, including the comparison of the different presentation formats, was studied by means of self-reports, a recall test, an expert-based usability test and observations.

Results. Sub study A showed that participants had a positive attitude towards the addition of persuasive (game) elements, with performance feedback and positive reinforcement being the most desirable. Furthermore, there seemed to be a need for more explanation about the aim and effect of the training. Sub study B showed that overall, the persona-based design brief had a considerable impact on the design. Regardless the format, the persona seemed to have several benefits, such as more insight into the user and detecting design flaws at an early stage. The results regarding the impact of the different presentation formats are equivocal. On the one hand there are indications in favour of the pictorial design brief, but on the other hand there are no convincing differences between the prototypes.

Conclusion. The current study suggests that persona-based design briefs have a positive impact on the design of a prototype. Several advantages of personas were shown, such as the enhancement of user-centered thinking. With regard to the presentation of the design briefs, there are careful indications that a pictorial design brief is more effective than a text-based design brief. Both design briefs can be perceived as having a narrative style, which might be an explanation for the positive findings of the current study. Possibly, the narrative style was enhanced by the increased vividness of the pictorial design brief. The current study applied the use of personas in a practical, real-life design project, of which promising results were shown. More empirical research with regard to the use of personas in design is highly needed.

Keywords: *User-Centered Design, Personas, Persuasive technology, Gamification, eHealth, Cognitive Bias Modification, Serious games, Adherence, Design brief.*

Samenvatting

Achtergrond. Breindebaas is een app met als doel de onbewuste processen die een alcoholverslaving in stand houden te doorbreken, door het hertrainen van de automatische toenaderingstendens. Een eerdere studie toonde lage therapietrouw, vanwege het repetitieve karakter van de trainingstaak dat als saai werd ervaren. Het primaire doel van deze studie is het ontwerpen van een persuasief prototype dat therapietrouw van gebruikers en acceptatie van professionals verbeterd. Het secundaire doel is om de impact te bestuderen van op persona gebaseerde design briefs op het ontwerpproces en de prototypes, waarin verschillende presentatievormen worden vergeleken.

Methode. In deelstudie A zijn er semigestructureerde interviews afgenomen bij potentiële gebruikers (n=7) en professionals (n=5), met als doel het in kaart brengen van hun behoeftes, wensen en acceptatie over het toevoegen van persuasieve (spel) elementen. De getranscribeerde interviews werden omgezet in user requirements. In deelstudie B werden deze requirements gebruikt om een op persona gebaseerde design brief te creëren in twee verschillende stijlen. Twee ontwerpteams kregen ofwel een tekstuele brief ofwel een geillustreerde brief aangeboden en werden geïnstrueerd aan de hand hiervan een persuasief prototype te ontwerpen. Invloed van de op persona gebaseerde design brief op het prototype en proces, inclusief de vergelijking van de verschillende presentatie stijlen, werd onderzocht door zelfrapportage, een herinneringstest, een expert-gebaseerde gebruiksvriendelijkheidstest en observaties.

Resultaten. Deelstudie A liet zien dat deelnemers een positieve houding hadden tegenover het toevoegen van persuasieve (spel) elementen, waarbij feedback en positieve bekrachtiging het meest gewenst waren. Daarnaast bleek er behoefte te zijn aan meer uitleg over het doel en effect van de training. Deelstudie B toonde aan dat de op persona gebaseerde design brief over het algemeen een aanzienlijke invloed had op het ontwerpproces. Ongeacht de presentatie stijl leek de persona verschillende voordelen te hebben, zoals het creëren van meer inzicht in de gebruiker en het ontdekken van ontwerpfouten in een vroeg stadium. De resultaten met betrekking tot de verschillende presentatie stijlen zijn niet eenduidig. Enerzijds zijn er aanwijzingen ten gunste van de geillustreerde design brief, anderzijds zijn er geen overtuigende verschillen te zien tussen de prototypes.

Conclusie. De huidige studie suggereerde dat op persona gebaseerde design briefs een positieve invloed hebben op het ontwerpproces. Verschillende voordelen kwamen naar voren, zoals het bevorderen van gebruikersgericht denken, waarbij er voorzichtige aanwijzingen zijn dat een geillustreerde design brief effectiever is dan een op tekst gebaseerde design brief. Beide design briefs hebben een narratieve stijl, wat een mogelijke verklaring kan zijn voor de positieve bevindingen. De narratieve stijl in de geïllustreerde brief was mogelijk verlevendigd door het toevoegen van afbeeldingen. De huidige studie paste het gebruik van personas toe in een praktisch ontwerpproject, waarvan veelbelovende resultaten werden getoond. Meer empirisch onderzoek met betrekking tot het gebruik van personas is zeer gewenst.

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Introduction

1.1. Alcohol consumption

Alcohol consumption is one of the most important risk factors for disease and death worldwide, causing 5.1% of the global burden of disease and injury and 5.9% of all deaths (WHO, 2014). Alcohol consumption has multiple health consequences, such as diabetes, gastrointestinal diseases, cardiovascular diseases, and several types of cancer. Furthermore, it can cause neuropsychiatric conditions, in which Alcohol Use Disorders (AUDs) are the most important. AUDs are a combination of alcohol abuse and alcohol dependence, as defined by the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013). Besides the impact on mental and physical health, alcohol consumption may also lead to socioeconomic consequences and harm to other individuals (WHO, 2014).

Alcohol-related problems are a major public health concern, with overconsumption being very common. In the Netherlands, almost 9% of adults consume excessive amounts of alcohol, which is defined as more than 21 glasses a week for men and more than 14 glasses a week for women (Van Laar & van Ooyen-Houben, 2016). The paradox in this unhealthy addictive behaviour is that people continue excessive alcohol consumption, despite their knowledge of the negative consequences (Wiers & Stacy, 2006).

1.2. Theoretical approach: the role of implicit cognition

Traditional cognitive models, such as the Theory of Planned Behaviour (Ajzen, 1991), explain the existence of unhealthy behaviour (such as alcohol abuse) by the influence of subjective norms, attitudes and perceived behavioural control on the intention to change behaviour. However, these models lack explanation why people continue excessive alcohol use, even if they are aware of the harmful consequences. It seems that addictive behaviour is often not a reflective decision, in which a person carefully considers the advantages and disadvantages (Stacy & Wiers, 2010). Dual process models of addiction (Stacy, Ames & Knowlton, 2004; Wiers et al, 2007) assume that excessive drinking behaviour is not only produced by rational processes, but also by implicit cognitive processes.

The Reflective-Impulsive model (Strack & Deutsch, 2004), which is based on dual process theory, distinguishes two systems: the impulsive system, which is automatic and fast, and the reflective system, which is slower, involves conscious reflection and can be seen as the rational generator of behaviour. Dual-process models of addiction assume that addictive

behaviours derive from an imbalance between these two systems (Wiers & Stacy, 2006; Wiers et al., 2007). The impulsive system becomes sensitized when alcohol is repeatedly consumed. As a result, people become more sensitive to alcohol-related stimuli and might develop a stronger tendency to automatically approach alcohol (Robinson & Berridge, 2001). These impulses can be inhibited by the reflective system, when there is enough ability and motivation. However, alcohol consumption can impair the ability to inhibit (Bechara, Noel, & Crone, 2006), which makes it more difficult to modify this behaviour. The imbalance between the systems will make addictive behaviour more driven by automatic impulses than rational cognitive processes. Existing interventions, that are usually information-based and require users to reflect on their own behaviour, do not always show the desired results (Marteau, Hollands, & Fletcher, 2012).

1.3. Cognitive Bias Modification

Nowadays, more and more attention is being paid to interventions that focus on the implicit processes. Increasingly, Cognitive Bias Modification (CBM) programs are used to re-train the implicit processes involved in addiction (Eberl et al., 2013). CBM is a collection of training techniques that aim to change the automatic and impulsive reactions by training the brain to break learnt thought patterns ('biases').

The CBM Alcohol Approach Avoidance Training already showed to be successful in modifying the approach bias in hazardous drinkers (Wiers, Rinck, Kordts, Houben, & Strack, 2010). In this computer task, users have to avoid pictures of alcoholic beverages and approach pictures of non-alcoholic beverages by respectively pushing and pulling a joystick. The task contains a zooming feature, in which the picture size will decrease when the picture is avoided and increase when the picture is approached. This zooming feature enhances the feeling of approaching and avoiding (Neumann & Strack, 2000).

The CBM Alcohol Approach Avoidance Training was previously tested in a clinical setting (Wiers, Eberl, Rinck, Becker, & Lindenmeyer, 2011). There were two experimental groups, who received a real training which was either a relevant feature version or an irrelevant feature version, both consisting of four sessions of two hundred responses each. In the two control groups, patients received either a sham training or no training at all. The experimental groups showed better treatment outcomes one-year post-intervention. Furthermore, the results showed that the intervention successfully retrained the approach bias in alcohol-dependent patients to an avoidance bias for alcohol (Wiers et al., 2011). These findings suggest that a brief CBM intervention can be effective in reducing alcohol intake.

In a replication study of Eberl et al. (2013), patients who received CBM next to their treatment as usual (Cognitive Behavioural Therapy), showed a significant lower relapse rate at one-year follow up compared to patients who only received treatment as usual. This effect was mediated by a retrained alcohol-approach bias (Eberl et al., 2013). More recent research showed positive results of approach bias modification on the reduction of both approach bias and alcohol consumption (Kakoschke, Kemps & Tiggemann, 2017).

1.4. Mobile Application Breindebaas

Recently, this proven to be effective desktop computer CBM Alcohol Avoidance Training was converted into a smartphone app called Breindebaas. Breindebaas is a mobile application developed by Tactus Addiction Institute. The goal of this app is to reduce alcohol intake among problem drinkers by letting users repeatedly train, independent of treatment. During a training session in the Breindebaas app, one hundred pictures of both alcoholic beverages and non-alcoholic beverages are displayed. Users have to bring pictures of non-alcoholic beverages closer and swipe pictures of the alcoholic beverages away from them. The ratio between alcoholic and non-alcoholic pictures is fifty-fifty and completing one training session takes about 5 to 10 minutes.

1.4.1. Rationale for the current study

Recently, a pilot study has been carried out to examine the effects of the Breindebaas app in a non-clinical setting (Somsen, 2017). Participants that performed the CBM training were people from the general population who consumed alcohol regularly and were motivated to reduce intake, but were not in treatment. Somsen (2017) used a single-group design to compare alcohol consumption at baseline with alcohol consumption post-intervention. Participants were asked to complete the training twice a week for a total period of three weeks. The results showed that alcohol consumption, compared to baseline, declined with an average of eight standard units a week. A follow up study showed that reduction of alcohol-use is not only short-term, but still visible and even more declined at three months post-treatment (Nijen Es, 2017). These findings suggest that the Breindebaas app has potential for reducing alcohol consumption among problem drinkers in a non-clinical setting.

Somsen (2017) used open-ended questions to evaluate participants' opinion about the Breindebaas app. Although the app was described as easy and user-friendly, many participants indicated that the Breindebaas app was boring and monotonous. Furthermore, almost half of the participants did not complete the recommended number of six training

sessions (Somsen, 2017). These findings converge with a qualitative study concerning attitudes towards Cognitive Bias Modification. The repetition that is required in CBM often makes the tasks tedious and boring (Beard, Weisberg & Primack, 2012). Therefore, it is important to motivate the participants to keep training (Wiers & Salemink, 2015).

On the basis of the pilot results, two important points for improvement emerged (Somsen, 2017). The first point is to tailor the images to the individual, so that participants can select their own favourite drinks and thus create a personal training. The second point is adding game elements to challenge participants more and encourage them to keep training. Hence, the practical motive for the current study is to implement these adjustments by developing a new version of the Breindebaas app that improves adherence.

1.5. Motivation according to the Self-Determination Continuum

On the basis of the pilot study results, that showed low adherence, the question that arises is: how can we improve the motivation to adhere? A popular theory of moitivation is the Self-Determination Theory by Ryan & Deci (2000). The Self-Determination Theory makes a distinction between intrinsic motivation and extrinsic motivation. Defining those terms can be confusing, while they can be closely entangled. Therefore, the Self-Determination Continuum (Ryan & Deci, 2000) can be used to define the different types of motivation.

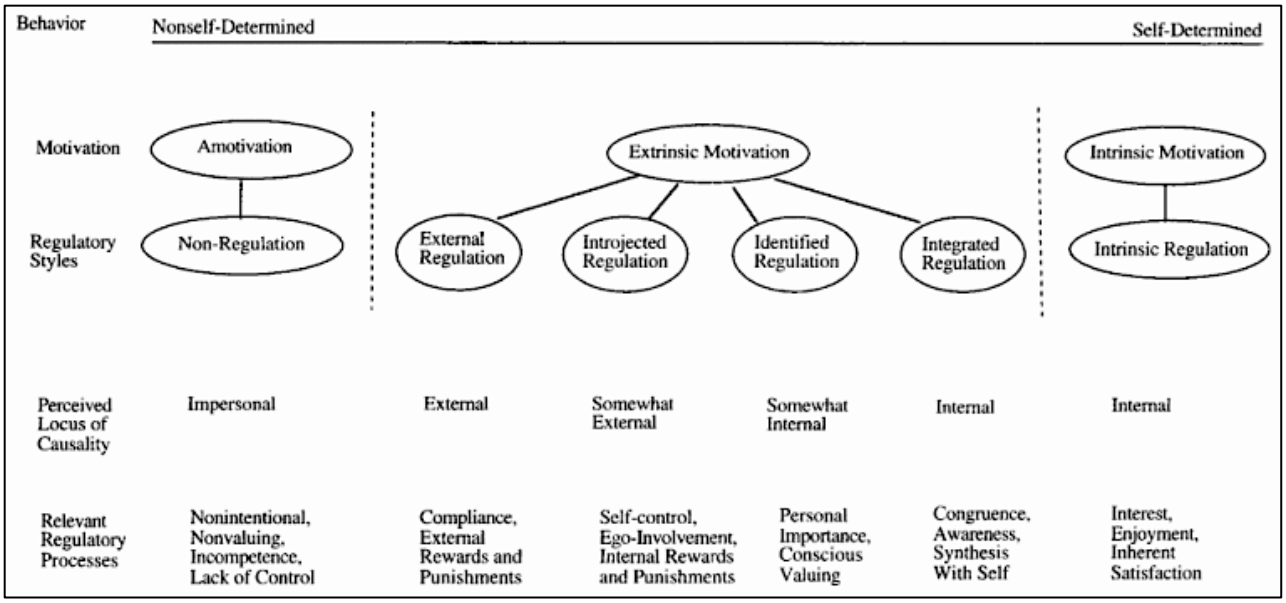

Figure 1.1 The Self-Determination Continuum (Ryan & Deci, 2000).

As described in 'the Self-Determination Continuum' in Figure 1.1, motivation can be viewed as a line with 'amotivation' at one end and 'intrinsic motivation' at the other end. When

people are purely amotivated, they will not be able to be stimulated to display certain behaviour. On the other hand, when people are intrinsically motivated, they will show certain behaviour by themselves without having to use external stimulation. They are "doing something because it is inherently interesting or enjoyable" (Ryan & Deci, 2000, p.55). Everything in between amotivation and intrinsic motivation is called extrinsic motivation, varying in the extent to which their regulation is autonomous. While users in the pilot study showed low adherence, it is presumed that users will not be fully intrinsically motivated to train in the Breindebaas app. Therefore, extrinsic motivation needs to be amplified to foster the motivation to adhere (McCallum, 2012).

With regard to motivation, it should be noted that there is a difference between *motivation to change* and *motivation to train*. The motivation to change includes the motivation to tackle the excessive substance use, while the motivation to train concerns the completion of a CBM training (Boffo, Pronk, Wiers, & Mannarini, 2015). In this paper the focus is on improving the motivation to train, or in other words, the adherence to treatment.

1.6. Persuasive technology

The Self-Determination Theory provided explanation and definition of motivation, suggesting that extrinsic motivation needs to be amplified to improve adherence in the Breindebaas app. The question that remains is how the new app should be designed in order to increase motivation and engagement of users. This can be explored by using the Persuasive System Design (PSD) model (Figure 1.2), which provides a more concrete guideline on how technology can affect motivation (Oinas-Kukkonen and Harjumaa, 2009).

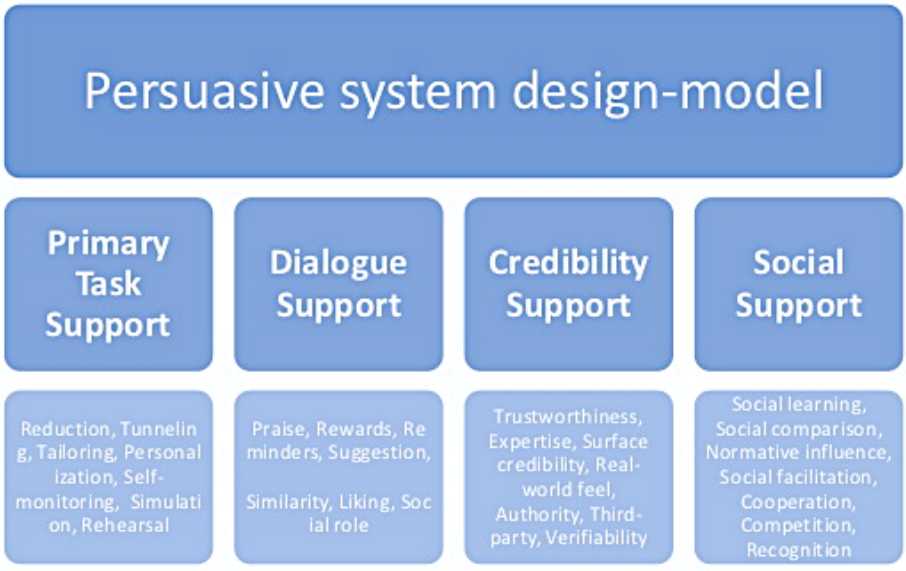

Figure 1.2. The Persuasive System Design (PSD) model (Oinas-Kukkonen & Harjumaa, 2009)

Technology that is designed to change people's behaviour, engage and motivate them is also called *persuasive technology* (Hamari, Koivisto & Pakkanen, 2014). *Persuasive systems* can be defined as "computerized software or information systems designed to reinforce, change or shape attitudes or behaviours without using coercion or deception" (Oinas-Kukkonen & Harjumaa, 2008, p. 164). Therefore, the new Breindebaas app, that is aimed at improving motivation to adhere, can be defined as a persuasive system. The PSD-model provides a framework for designing such persuasive systems.

In the PSD-model, several persuasive system principles are divided into four categories. The first category of the PSD-model is the *primary task support*, which focuses on supporting the user in carrying out the primary task. Design principles related to this category are for example reduction, tunnelling and self-monitoring. The second category of the PSD-model is the *dialogue support*, which concerns the interaction between the user and the system. Design principles related to this category are for example rewards, reminders and liking. The third category of the PSD-model is *credibility support*, which refers to designing a system that is credible and therefore more persuasive. Design principles related to this category are for example trustworthiness, expertise and authority. The fourth category of the PSD-model is *social support*, focusing on using social support within the system to increase persuasiveness. Design principles related to this category are for example social learning, normative influence and cooperation. According to Oinas-Kukkonen and Harjumaa (2009), including persuasive design principles from each category into the system will make technology more persuasive. Therefore, including persuasive elements in the new Breindebaas app might improve the motivation to adhere.

1.7. Gamification to improve motivation

A theory that draws upon persuasive technology design principles, is gamification theory (Fogg, 2002). Gamification is the use of game elements in non-game context to improve user experience and user engagement (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). Persuasive technology and gamification both include the use of technology aimed at affecting the users' motivation (Hamari et al., 2014). The difference is that persuasive technology focuses more on attitude change and social and communicative persuasion, while gamification focuses more on instigating the users' motivation (Hamari et al., 2014).

Gamification provides extrinsic motivators for a change in behaviour (McCallum, 2012). While extrinsic motivation needs to be amplified, the addition of game-elements in the Breindebaas app might be used to foster the motivation to adhere. Gamification can be used to

create a *serious game,* which is a relatively new term for games used for other purposes than merely entertainment. Serious games can also be described as *persuasive* games, while they are designed to engage and motivate people (Bogost, 2010).

1.7.1. Gamified cognitive training paradigms

Several studies suggest that adding game elements can help to increase motivation to train (Boendermaker, Boffo, & Wiers, 2015; Boendermaker, Prins, & Wiers, 2015). Although the use of game elements in apps concerning cognitive training seems to be a relatively new topic, several attempts have been made to gamify cognitive training paradigms, such as Braingame Brain. Braingame Brian is a cognitive control training, in which gaming elements were added to computerized Executive Functions tasks (Prins et al., 2013). Research already showed that Braingame Brian is effective in children with obesity (Verbeken, Braet, Goossens, & van der Oord, 2013) and children with ADHD (Van der Oord, Ponsioen, Geurts, Ten Brink, & Prins, 2014). More recently, a working memory capacity training in adolescents has been shown to benefit from the use of game-elements by increasing motivation to train (Boendermaker, Gladwin, Peeters, Prins, & Wiers, 2018). These results are promising for using gamification to improve adherence in CBM training tasks, such as the Breindebaas app.

1.7.2. Active ingredients of gamification

In the Breindebaas app, gamification was slightly used by adding a high score and encouraging words. Several screens of the Breindebaas app are shown in Figure 1.3.

Figure 1.3. Pictures of respectively the main screen of the Breindebaas app and the end screen which provides the user with an overview of (high) scores and response time.

In the pilot study (Somsen, 2017), participants of the Breindebaas training mentioned the creation of more levels or game options as a suggestion to improve the app. They described the app as boring and monotonous, and participants indicated that they would like to see more game-elements in the app.

There is no consensus yet on which elements are 'active ingredients' of gamification. However, Cugelman (2013) reviewed several popular gamification taxonomies and identified seven core ingredients of gamification. According to Cugelman (2013), these core ingredients are broad principles that make technology persuasive and adding (some of) these strategies will instigate behaviour change. Cugelman (2013) argues that technology is no longer persuasive if these ingredients are removed. These seven core ingredients, including their explanation, can be found in Table 1.

Table 1.

The seven core ingredients of gamification (Cugelman, 2013).

Core ingredients	Explanation
1. Goal setting	Committing to achieve a goal
2. Challenges	Growth, learning, and development
3. Performance feedback	Receiving constant feedback
4. Reinforcement	Gaining rewards, avoiding punishments
5. Compare progress	Monitoring progress with self and others
6. Social connectivity	Interacting with other people
7. Fun and playfulness	Paying out an alternative reality

A relatively new way of motivating, that was not addressed by Cugelman (2013), is the use of motivational agents (Mumm & Mutlu, 2011; van der Meij, van der Meij & Harmsen, 2015). While these motivational agents embody human-like qualities, they seem to have a positive effect on how users process verbal feedback (Mumm & Mutlu, 2011). These virtual coaches personalize the learning task and give people a positive feeling, which increases engagement and motivation (Lester et al., 1997).

Although results of adding game-elements to cognitive trainings are promising, acceptance of users is essential. Therefore, potential users of the app should be involved in the process of designing a persuasive version of the Breindebaas app. A framework for participatory eHealth development is the CeHRes Roadmap (van Gemert-Pijnen et al., 2011).

1.8. The CeHRes Roadmap: Center for eHealth Research Roadmap

The CeHRes Roadmap is a framework for holistic eHealth development and evaluation (van Gemert-Pijnen et al., 2011; Nijland, 2011). This approach is characterized by the emphasis on User-Centered Design (UCD) principles.

1.8.1. User-Centered Design

User-Centered Design includes the involvement of potential users throughout the design process, empirical measurement of usage and the use of iterative design (Gould & Lewis, 1985; Norman, 1986). Adopting a UCD approach, in which users are actively involved throughout the entire design process, has been shown to have several advantages over a technology-driven approach, in which the focus is on the technical aspects of the system with taking minimal account of the needs of the user. UCD has been shown to lead to more acceptance of the system, better adherence, greater user satisfaction and better implementation of the technology (van Gemert-Pijnen, Peters, & Ossebaard, 2013). The CeHRes Roadmap advocates the use of UCD principles.

The CeHRes Roadmap consists of five different components (Figure 1.4):

1. *Contextual Inquiry:* identify the users and stakeholders' needs and problems.
2. *Value Specification:* determine values of the users and translation into requirements.
3. *Design:* creating the prototypes.
4. *Operationalization:* implementation of the intervention.
5. *Summative Evaluation:* evaluation of the uptake and effect of the intervention.

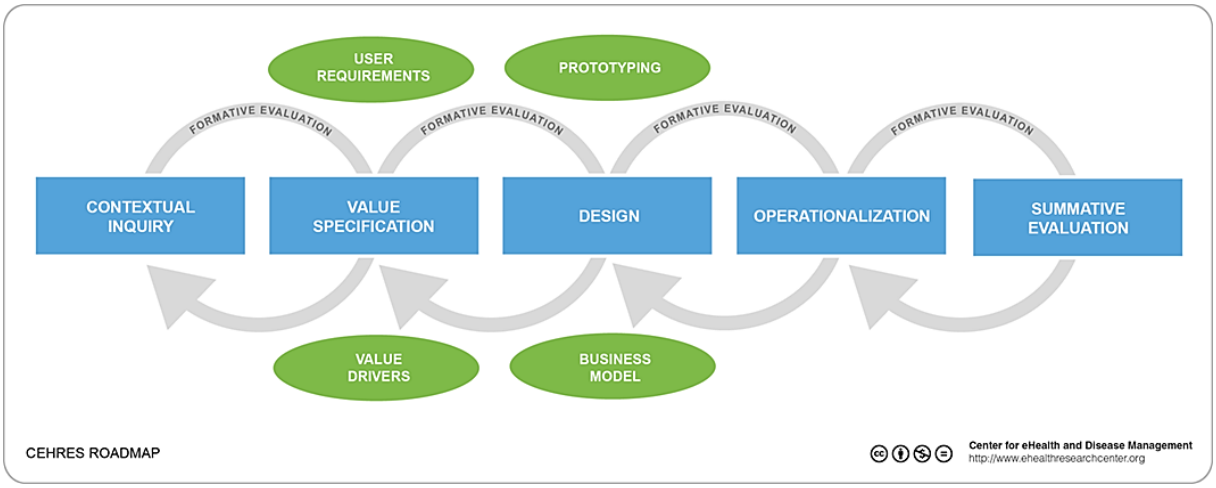

Figure 1.4. The CeHRes Roadmap. (Van Velsen, van Gemert-Pijnen, Nijland, Beaujean, & Van Steenbergen, 2012).

The development of the Breindebaas app was an iterative process. When the first version of the app was developed, the cycle of the CeHRes Roadmap has already been completed. In the summative evaluation, clear points for improvement emerged, such as the addition of game-elements to improve adherence. This led to the decision to redevelop the app and to start the cycle again from the beginning, in which stakeholders should be included to improve the suitability of the app and foster successful implementation. Therefore, the primary aim of the current study is to design a persuasive prototype of the app that improves adherence and acceptability by professionals. As can be seen in a more detailed version of the CeHRes roadmap (Figure 1.5), prototypes can be created by using requirements, personas and scenarios.

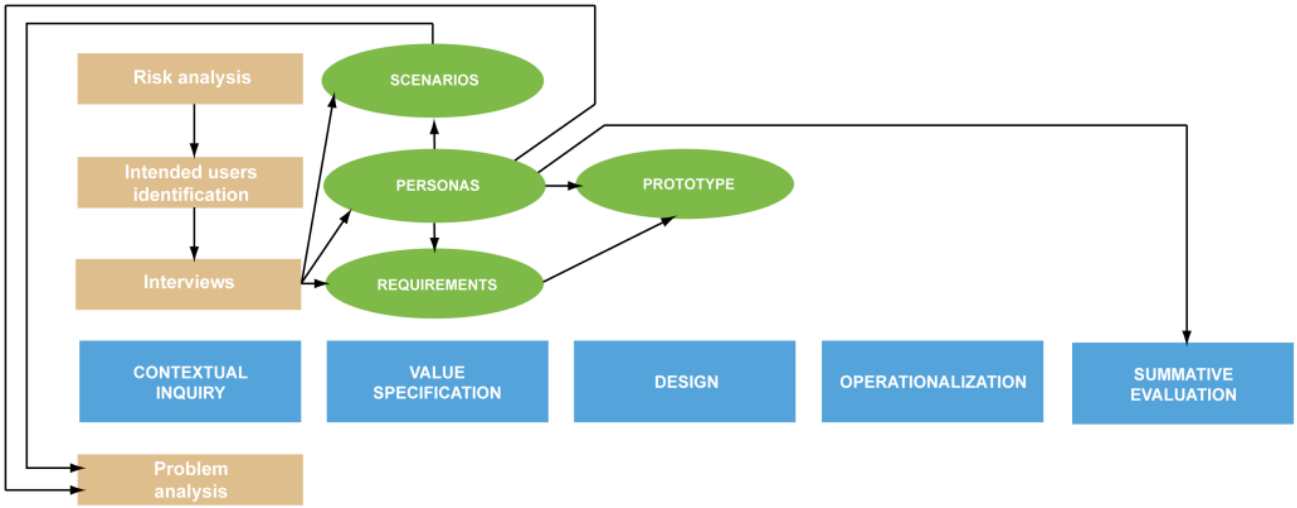

Figure 1.5. A more detailed version of the CeHRes Roadmap (Van Velsen et al., 2012).

1.8.2. Personas in User-Centered Design

When developing a prototype within a UCD approach, the use of *personas* is an increasingly common way to enhance user-centered thinking among designers (Pruitt & Adlin, 2010). Personas were originally invented by Alan Cooper (1999), who defined them as "*hypothetical archetypes* of actual users". Personas are non-existent, fictional characters that are representatives of a target group, and thus 'embody' the end users (Cooper, 1999). Multiple personas can be used to symbolize the different user types of a product.

Design teams regularly make decisions without realising who will use the product and how they will use it. Hence, personas can be used to strengthen the focus on the users (Pruitt & Grudin, 2003). It stimulates making decisions with the persona in mind and to question why they are building certain features. After all, they have to consider if this feature is what the persona wants or needs. Because of this early focus on the end users, designers are more

tended to make the best fitting decisions. In this way, it is easier to avoid unnecessary and poorly functioning functionalities, which is also cost-effective (Cooper, 1999).

Miaskiewicz & Kozar (2011) provided an overview of persona benefits that are suggested in literature (Table 2). Although this literature does not seem to reach consensus about the universal benefits of personas, it appears that personas can make a substantial contribution to the design process, for example by strengthening the focus on the users.

Table 2.

Benefits of persona use suggested in literature (Miaskiewicz & Kozar, 2011).

Source	*Specified benefits*
Cooper (1999)	- Increase focus on the users and their goals - Facilitate effective communication about users - Reduce necessary changes at the end of the development process
Cooper and Reimann (2002)	- Build consensus and commitment to design - Help to measure a design's effectiveness - Define the product's feature set - Facilitate effective communication within the project team - Help other related efforts such as marketing plans
Grudin and Pruitt (2002)	- Facilitate a focus on users and work contexts - Allow for extrapolation from partial knowledge of users to diverse contexts - Make assumptions about users explicit - Facilitate effective communication about the users - Increase focus on a specific audience
Long (2009)	- Strengthen focus on the users during the development process - Lead to more user-friendly designs - Make the user needs more explicit - Guide decision making
Ma and LeRouge (2007)	- Facilitate effective communication about the users - Enhance identification with the target users - Increase focus on user needs
Pruitt and Adlin (2006)	- Make assumptions about users explicit - Narrow the users being designed for - Lead to better design decisions - Increase engagement among the design team - Build empathy for the users

In a case study, in which personas were used to redesign a learning support system, personas were found to be a useful way of communicating user data (Dotan, Maiden, Lichtner, & Germanovich, 2009). Personas made the information about end users referable, meaningful and prominent, which stimulated the user-centered design process (Dotan et al., 2009).

1.8.3. Use-case scenarios in User-Centered Design

Although personas seem to improve engagement with the user, they do not reveal much detail about the user requirements. Therefore, use-case scenarios can be a useful tool, in which personas serve as the basis. Use-case scenarios are descriptions of a persona interacting with

the system or product (Cooper, 1999). They can be used to communicate the requirements to the designers. Long (2009) investigated whether different presentation formats of these scenarios affected the design results. Industrial Design students, who were asked to conduct a design project, received either a visual storyboard or a text-based scenario. Results showed that the visual storyboard seemed to be more effective than the text-based version, while it led to more detailed and user-centered design solutions. A possible explanation for this finding was that the storyboard might make it easier for the designers to visualize user problems (Long, 2009). Besides the study of Long (2009), further empirical evidence about the best way of presenting scenarios to designers is lacking. Literature concerning the addition of pictures to written text suggests that illustrations are valuable text adjuncts (Fang, 1996; Carney & Levin, 2002). Several advantages of adding pictures to written text are named, such as contributing to the text's coherence, reinforcing the text, motivating the reader and promoting creativity (Fang, 1996). The advantages of adding pictures to written text are supported by dual-coding theory (Paivio, 1971). This theory states that by combining a picture with the written word, two processing systems are addressed: a visual and a verbal process. Written or spoken text is stored once, but images are stored both verbally and visually (Paivio, 1990). Adding images is preferable, while this information is stored in two different ways leading to an increased chance of retention and comprehension (Paivio, 1971). Therefore, a pictorial presentation of a scenario is possibly superior to a text-based version.

Rationale secondary study aim

Although personas and scenarios seem to have several advantages in design, empirical literature is very sparse. Besides, evidence is lacking about how to brief a persona and scenario and what is the most effective presentation format when briefing designers. Very limited studies have addressed the use of personas in design, suggesting that this is a relatively new topic. Due to this clear research gap, there seems to be an urgent need for more empirical research about the use of persona-based scenarios in designing eHealth software. Therefore, it seems valuable to include these promising tools in the current study in a persona-based design brief, as a method for presenting and communicating user information to the designers. It is expected that this tool will stimulate designers in creating user-centered prototypes. Besides the practical aim of using personas, it also seems interesting to explore whether the findings of the current study confirm existing persona literature. Therefore, the secondary aim is to study the impact of persona-based design briefs on the design process and prototypes, in which different presentation formats are compared.

1.9. Study aims & research questions

The current study focuses on the redevelopment of a new and better version of the Breindebaas app. The primary aim of the current study is to design a prototype of a persuasive mobile alcohol avoidance training that improves adherence and acceptability by professionals. The secondary aim is to study the impact of persona-based design briefs on the design process and prototypes, in which different presentation formats are compared. The CeHRes Roadmap is used as a guideline for both study aims, in which the focus is on the first three phases: the contextual inquiry, the value specification and the design phase. The current study is separated into two sub studies, which are both supported by a more detailed version of the CeHRes Roadmap (Figure 1.5).

1.9.1. Sub study A: From User Expressions to User Requirements

Sub study A involves the contextual inquiry and value specification. In this study the needs and wishes of potential users and professionals are examined by means of interviews, with the aim of mapping out their needs, wishes and acceptance for adding persuasive (game) elements. The input of participants is used for the creation of user requirements.
Sub study A contains the following research question:

- *What are the needs and wishes of potential users and professionals regarding the Breindebaas app and which adjustments have to be made in the app according to their perspective?*

1.9.2. Sub study B: From Persona to Prototype

Sub study B involves the value specification and design phase of the CeHRes Roadmap. This sub study includes the creation of two persona-based design briefs, on the basis of the user requirements. Two design teams are provided with different design briefs: one team receives a pictorial design brief and the other a text-based design brief, based on the approach of Long (2009). It is expected that the pictorial presentation of the scenario might be somewhat more effective in design than the text-based version.
Sub study B contains the following research questions:

- *What are the influences of the persona-based design brief on the prototype and design process?*
- *To what extent do the pictorial design brief and the text-based design brief lead to different prototypes and how can these differences be explained?*

Methods A: *From User Expressions to User Requirements*

Design

Sub study A consisted of the contextual inquiry and value specification. This was a qualitative study, using semi-structured interviews. The aim was to get input from potential users and professionals, to determine their needs, wishes and acceptance towards the addition of persuasive (game) elements. Expressions from stakeholders in the interviews were translated into user requirements, which are the features a product or system should have according to the users' perspective (Courage & Baxter, 2005).

Participants

Twelve participants were recruited by means of purposive sampling (Tongco, 2007). Participants were potential users of the app and professionals in the field of addiction care.

Potential users

The potential users were people from the general population who wanted to decrease their alcohol consumption (n=3) and alcohol (ex)-clients of Tactus Addiction Institute (n=4). Inclusion criteria for the potential users from the general population were that (1) participants consumed alcohol regularly, (2) would possibly use the Breindebaas app when their alcohol consumption would become a problem, (3) were familiar with a smartphone and (4) were 18 years or older. Inclusion criteria for the potential users from addiction care were that (1) participants were clients or ex-clients with alcohol addiction from Tactus Addiction Institute, (2) would possibly use the Breindebaas app, (3) were familiar with a smartphone and (4) were 18 years or older. Characteristics of the potential users can be found in Table 3.

Table 3.

Characteristics of the potential users.

Respondent number	Gender	Age	Group
1.	Male	25	General population
2.	Female	45	General population
3.	Male	26	General population
4.	Male	52	Client
5.	Female	24	Client
6.	Male	42	Client
7.	Male	36	Client

Professionals

The professionals (n=5) included a psychiatrist, clinical psychologist, psychological wellbeing practitioner, social worker and general practitioner. Inclusion criteria for the professionals was that participants had an occupation in the field of alcohol addiction. Characteristics of the professionals can be found in Table 4.

Table 4.

Characteristics of the professionals.

Respondent number	Age	Gender	Group
8.	-	Female	Professionals
9.	41	Female	Professionals
10.	35	Male	Professionals
11.	40	Female	Professionals
12.	42	Female	Professionals

Materials

Two interview schedules with open questions were developed for conducting the semi-structured interviews. The interview schedule for the potential users can be found in Appendix A. The interview schedule for the professionals can be found in Appendix B.
By using semi-structured interviews, the structure of the interview was maintained, while having the option to ask for explanations or examples (Van Teijlingen, 2014). The interview for the potential users started with a few demographic questions and a general question about smartphone use related to health. After these questions, the actual interview started. The first part of the interview included questions about the aim and explanation of the training. The second part of the interview included questions about the training session itself. This included for example the participant's opinion about the length of the session and the pictures. The last part of the interview included questions about the motivation to train in the app. This included discussing options for improving motivation to train, such as gamification, of which multiple examples were shown. The interview for the professionals included the same questions, but some questions were adjusted to what they thought their clients would want or need. Furthermore, questions about implementation were included. The focus was on if they would recommend the app and which adjustments have to be made to make the app more credible and reliable. The length of each interview was 30 - 45 minutes.

Procedure

The current study has received ethical approval from the Ethics Committee. Before the start of the interviews, participants were asked to sign informed consent (Appendix C). The informed consent explained the aim of the study and guaranteed anonymity and confidentiality. Participants were informed that the interviews were recorded with a voice-recorder. In the interview, the instruction video was shown to the participants prior to the questions about this topic. Furthermore, participants were asked to complete one training session before or during the interview. The interviewer encouraged participants to give their own honest opinion. Interviews were alternately conducted by two researchers.

Analysis

Coding and transcribing

While the results were used as input for the design of the Breindebaas app, only expressions relating to the purpose of this research were transcribed verbatim (Poland, 1995). The recordings were rewound multiple times to transcribe accurately. After transcription, thematic analysis was conducted (Braun & Clarke, 2006). This process started with the familiarization with the data and the generation of initial codes. Then, the codes were transformed into themes and sub themes and the potential themes were reviewed. This was an iterative process, in which generating themes was both deductive and inductive (Joffe & Yardley, 2004). The labels for the final themes and sub themes can be found in Appendix D.

Formulating user requirements

After transcribing and coding the interviews, the process of user requirement formulation started. User expressions were transformed into requirements when they were described frequently or when they captured an important aspect of the overall goal of the app (Braun & Clarke, 2006). This approach was based on Bergvall-Kåreborn and Ståhlbröst (2010). The translation process from user expression into user requirement was done as in the example in Table 5. First, the most important and relevant user expressions were selected and filled out in the column '*user expressions'*. Expressions that captured the same aspects were grouped. In the example in Table 5, this were the expressions *"Bij sommige plaatjes heb ik minder associatie dan met anderen. Dan kun je eruit halen wat je niet wilt."* (A1) and *"Als ik zo'n training zou doen zou ik die het liefst doen met drankjes die ik ook echt drink."* (P3). The second step was determining the underpinning user need of these expressions. The user expressions showed that users would like to personalize their own training by selecting only

pictures that are relevant to them. Therefore, the 'general user need' related to the expressions was *personalization.* In the third step, the user expressions and needs were translated into 'design-oriented user needs', which included that *users want to be able to choose the pictures that are most relevant to them.* Finally, the design-oriented user needs were translated into 'user requirements'. These 'user requirements' described the desired features or performance of the system according to the users. In the case of the example, this was that *the system allows users to select alcoholic and non-alcoholic drinks from a database.*

Table 5.

Example of the translation process from user expression to user requirement.

User Expression	**General user need**	**Design-oriented needs**	**User Requirement**
"Bij sommige plaatjes heb ik minder associatie dan met anderen. Dan kun je eruit halen wat je niet wilt." (A1)	Personalisation	Users want to be able to choose the pictures that are most relevant to them.	The system allows users to select alcoholic and non-alcoholic drinks from a database.
"Als ik zo'n training zou doen zou ik die het liefst doen met drankjes die ik ook echt drink." (P3)			

Results A: *From User Expressions to User Requirements*

This section describes the results of the interviews, in which participants were potential users (i.e. ex-clients of alcohol addiction treatment and people from the general population who were motivated to reduce alcohol intake) and professionals. In principle, the results are described for all participants in general. When there were clear differences between the sub groups, there was referred to the name of the sub group.

Use of smartphone apps regarding health

The interview started with an introduction question, with the intention to map the participants' attitudes towards using health-related smartphone apps. Most participants indicated that they have used these apps before, either for personal use or recommendation to clients. All participants had a positive attitude towards health-related apps, even when they did not use these apps themselves: *"Ik gebruik ze zelf niet, maar ik denk wel dat dat voor mensen helpend kan zijn. Ik zie dat wel als iets nuttigs."* (C4).

Information and explanation of the training session

Before the training session started, there was a short video in which the training was explained. Participants indicated that the video was useful: *"In dit geval denk ik dat het filmpje belangrijk is, het is lastig om dit in tekst uit te leggen."* (P3). Positive aspect was that the explanation was simple and short: *"Ik vind het heel fijn dat de uitleg heel kort en compact is."* (P1). However, several points of improvement were named. One of them was the speed of the video: *"De uitleg in het filmpje mag wel wat langzamer. Ik zou er rekening mee houden dat mensen met onze achtergrond toch wel wat trager zijn. Een rustig tempo is beter."* (C1) Another point of improvement was the audio quality: *"Ik kon horen aan de audiokwaliteit dat het budget heel laag lag. Voor mij was dat heel afleidend en heb ik het idee dat de kwaliteit van deze app misschien niet is zoals die van anderen. Je staat er toch iets sceptischer in misschien."* (A1). In terms of content of the video, it was clear to participants what they had to do in a training session: *"Ja, dat vind ik heel helder. Ook voor cliënten denk ik."* (P1).

In contrast, the purpose of the training was not clear: *"Het doel van het swipen snap ik niet helemaal."* (C1). Participants mentioned that they would like to have more information about the aim of the training: *"Het is denk ik belangrijk dat je weet wat het nut van de training is, dat zou ook uitgelegd moeten worden in het filmpje: wat je er nou eigenlijk aan hebt."* (C1). It was not clear to participants what the influence was of swiping on their actual

alcohol use: *"Wat uiteindelijk het effect is van het spelletje op het laten staan van alcoholische drankjes, dat komt niet duidelijk naar voren."* (P4). Besides, they also want to have an indication about when they can expect these effects: *"Ik zou ook graag van tevoren willen weten wanneer ik effect kan verwachten, zodat je niet te vroeg wonderen verwacht."* (A2). Participants indicate that it should be emphasized that they have to train repeatedly in the app: *"Volgens mij mag je dat [herhaaldelijk trainen] wel vaker horen. Het is 1 keer uitgelegd. Het mag wel duidelijker en vaker herhaald worden. Ook wel bij aanvang."* (P2). The term 'repeatedly training' should be specified as well: *"Daarnaast specifieker aangeven wat die 'herhaalde oefening' moet zijn, bijvoorbeeld twee of drie keer in de week."* (P1).

General opinion about training session

All participants were asked to complete one training session in the app. Afterwards, they indicated several positive and negative points. In general, participants had fun in completing a training session: *"Ik vond het leuk om te doen."* (P2) and they mentioned that the app was user-friendly: *"Ik vond hem ook gemakkelijk te gebruiken."* (A1). Participants were satisfied with the visual appearance and design: *"Ik vond hem ook mooi en hip vormgegeven, het zag er lekker fris uit."* (A1). However, participants indicated that the training was somewhat boring: *"De training was ook wel een beetje saai."* (P3). Several participants mentioned that they had to wait too long before a new picture appeared: *"Ik vind dat het swipen niet snel genoeg kan, er zit teveel tijd tussen de plaatjes."* (P1). Furthermore, the zooming feature was indicated as too subtle: *"Ik had ook verwacht dat als je een plaatje van je af swiped, dat hij dan veel verder weg verdwijnt. Het zooming effect mag wel sterker aanwezig zijn."* (P3).

Length of the training session

About the length of the training session was no consensus between participants. Various times, the number of pictures was indicated as too large: *"Ik vind 100 plaatjes wel lang."* (P2). As a result, participants started to feel annoyed, especially because the purpose of the training was not clear to them: *"Ik vind hem te lang, ik begon me te vervelen en werd ongeduldig. Dat komt ook doordat ik geen idee heb wat het zou moeten doen."* (C3). Knowledge about the effectiveness would influence their opinion about the length: *"Als ik weet dat het effectiever is neem ik de lengte voor lief."* (P1). However, several participants were satisfied with the current length of the training: *"De lengte is goed denk ik. Niet te lang niet te kort."* (A2). A small break was named as point of improvement: *"Ik zou opzich wel een kleine pauze willen."* (C1).

Pictures in the training session

Participants mentioned that the content of the pictures was not always clear: *"Sommige plaatjes mogen wat helderder, dat je ook direct weet wat het is."* (A3). This seemed to be relevant especially for (ex)-clients of addiction care: "*Om even terug te denken hoe ik zou denken als verslaafde, wie zegt dat dat koffie of thee is? Dat kan ook heel wat anders zijn, dat is dan niet heel erg duidelijk."* (C4). Participants indicated that several beverages were missing: *"Ik miste ook wel veel populaire drankjes, zoals shotjes of mixdrankjes."* (C1), and they would like to see more variation in pictures: *"Ik zou een grotere beeldbank willen zien."* (A3). Participants mentioned that not all pictures were relevant to them: *"Bij sommige plaatjes heb ik er geen mening over of die naar me toe moet of van me af. Ik drink bijvoorbeeld geen koffie, en dat ik die naar me toe moet halen gaat dan tegen mijn idee in."* (P3). One way to solve this problem is to let participants select their own pictures. This idea was presented to the participants, who seemed to be enthusiastic about this feature: "*Ja dat vind ik een goed idee. Ik denk dat het belangrijk is dat je aansluit bij wat mensen feitelijk ook drinken."* (P4). Even though this idea was positively received, professionals expressed some doubts about whether the effect of the app also continued for untrained pictures. They mentioned that alcohol clients often consume the same type of drink. Therefore, they were concerned that when users only select this type of drink, they remain sensitive for alcohol drinks that were not included in the training. Thus, they suggested to let users select a minimum number of several types of drinks: *"Ik merk wel dat mensen vaak heel eenzijdig drinken, dus dat zou je dan aan kunnen vullen met andere dranken."* (P4).

About the presentation of the beverages is no consensus. Most participants indicated that type of drink and brand are important: *"Type drankje en merk zijn belangrijk."* (P1). The brand is important for some participants:*"Ik ben wel merkgevoelig. Ik heb liever coca-cola dan pepsi."* (A1), but not for others: *"Het merk boeit mij niet zoveel. Wel het type drankje."* (A3). In general, it became clear that the pictures should resemble the actual situation: *"Ik denk dat het visueel zoveel mogelijk moet lijken op de situatie die jij ook tegenkomt. Dus dat het jouw merk halve liter bier blik is."* (P4). For some this meant the presentation in a glass came close to the temptation in real life: *"Ik heb het liefst het drankje gepresenteerd in een glas, want dan is het al klaar om te drinken. En de fles daarnaast staat er dan meer zodat je weet wat erin zit."* (A1).

During the interviews, participants were asked what effect the pictures had on them. Most participants were neutral and did not mention a positive or negative effect. However, some (ex)-clients of addiction care indicated that people with an alcohol problem can be

really sensitive to pictures of alcohol: *"Als je echt alcoholist bent kan zo'n plaatje al een enorme trigger zijn. Ik merk zelf ook dat ik de alcohol bijna proef en ruik."* (C1). Therefore, some ex-clients suggested to not recommend this app in the first phase of recovery: *"... ik kan mij voorstellen dat als iemand net in herstel zit en je krijgt dit voor je kiezen, dan weet ik niet of het heel handig is dat je steeds met die plaatjes geconfronteerd wordt."* (C3).

Implementation

The interviews with the professionals included some questions about implementation. Some professionals indicated that they would recommend the app to clients, providing that the client is familiar with a smartphone: *"Ja, ik zou het mijn cliënten aanraden, op voorwaarde dat zij goed overweg kunnen met een smartphone."* (P1). Others were more hesitating: *"Ik ben zelf ook een beetje sceptisch: ik vraag me af hoe werkt het en waarom. Ik moet nog wat wennen aan de geloofwaardigheid ervan en dat het ook echt iets doet."* (P3). When it comes to implementation, all professionals would like to have more information about the effectiveness of the app: *"De effectiviteit, dat ik weet dat het uit een onderzoek komt. Dat zou het voor mij betrouwbaarder maken."* (P2).

In general, all professionals showed a positive attitude towards the app and most of them mentioned they would recommend the app to clients. There seems to be a need for these kind of self-help apps in addition to traditional treatment: *"We zijn ook steeds op zoek naar welke alternatieven er al zijn, en daarin zou dit wel een welkome zijn." (P2).* However, they mentioned that they lack knowledge about this kind of apps and have no time to explore such interventions themselves: *"Het komt door tijdsgebrek en kennisgebrek, het zou met nascholing aan bod moeten komen."* (P5). While one of the target groups of the Breindebaas app is clients of alcohol addiction treatment, it seems interesting to elaborate further on the question what this means for implementation and possible requirements.

Frequency of sessions

Some participants mentioned that their motivation to train twice a week would be low: *"Voor één training sessie had ik wel de motivatie om hem af te maken. […] Twee keer per week zou ik nu niet doen.*" (A1). However, other participants mentioned that training every day would be easier for them: "*Als je het elke dag moet doen is het denk ik makkelijker om het in je routine te krijgen, dat je voor jezelf een plekje op de dag kiest waarop je de training gaat doen, bijvoorbeeld na het eten."* (C2). Professionals indicated that it is achievable to let clients train twice a week: *"Met de juist stimulering en motivatie moet het wel haalbaar zijn*

denk ik dat cliënten 2 keer per week een training volgen." (P3). Participants indicated that it is important that the app reminds them of the training: *"... dat de app je om de zoveel tijd waarschuwt dat je hem moet gebruiken door een reminder of pushbericht."* (A1).

Motivation to train

Participants were asked about how their motivation to train could be increased. More clarity about the training was mentioned as helpful: *"Ik denk dat het zou helpen als de deelnemer weet hoelang het ongeveer duurt. […] Als je daar meer helderheid en inzicht in geeft kun je het makkelijker volhouden."* (P1). Furthermore, it was named multiple times that participants liked the addition of game-elements: *"Er zit al een vorm van spel in, misschien moet het spelelement nog wat uitgebreid worden."* (C4). Participants described the app as monotonous and indicated that they would like the training to be more challenging in order to improve the motivation to train: *"Het belangrijkste voor mij is dat er een vorm van uitdaging in zit. Dat ik niet na twaalf keer nog steeds hetzelfde zit te doen en er helemaal niets veranderd*." (C4).

Gamification

In general, all participants had a positive attitude towards gamification. First, participants were asked to think for themselves about game-elements that could be added. They mentioned several game-elements that they would like to see in the app, such as rewards: "*Een sterretje, of een hartje of een duimpje. Iets simpels. […] Dat je het gevoel hebt, als ik hier vaak ben wordt dat beloond."* (A2). Professionals confirmed that rewards could be motivating: "*Ik merk dat cliënten gevoelig zijn voor complimentjes krijgen of een berichtje dat ze het goed hebben gedaan."* (P1). Another game-element that was mentioned by participants was adding levels to improve motivation: *"Dat er een level of hogere moeilijkheidsgraad in komt."* (P4). After letting participants come up with game-elements themselves, five game-elements were presented to the participants: goal-setting, performance feedback, challenge, storyline and motivational agents. Two of them were already mentioned spontaneously by participants: goal-setting and performance feedback. The other three game-elements were not mentioned spontaneously. Participants were asked to give their opinion about each game-element. The results below are ranked in order from most positive attitude to least positive attitude.

Performance feedback

All participants indicated that they would like the addition of performance feedback in the app: "*Ik denk dat het belangrijk is dat je wat meet en dat dat teruggekoppeld wordt."* (C3). Receiving feedback about their performance would give them a sense of usefulness: *"Dan heb je het idee dat je niet doelloos bezig bent. Dat het duidelijk is waar doe ik het voor."* (C1). As example of performance feedback, more insight in their alcohol use was mentioned: *"En een grafiek met het aantal glazen alcohol lijkt mij ook wel heel gunstig, dan zou ik daar meer op gaan letten."* (A2). However, participants indicated that timing is important*: "Maar dat zou dan wel na twee weken moeten, want je gaat niet al na 3 dagen minder drinken. Dan krijg je een schuldgevoel."* (A2). Another example of performance feedback that was mentioned by participants, was that they would like to have more insight in their progress: *"Ik zou het fijn vinden om te zien hoeveel sessies ik heb gedaan en hoeveel sessies ik nog moet doen."* (A3). Some participants would like to receive feedback about their reaction times: *"Feedback over snelheid tijdens het swipen zou ik ook fijn vinden"* (A1). Lastly, the bias score was explained. Participants showed a positive attitude towards feedback about the bias score. However, they also mentioned that a good explanation is needed: *"Bias zou ik ook wel willen weten, maar daar is wel een uitleg voor nodig."* (A1). Furthermore, they indicate that it could be too complicated for some users: *"Feedback over de bias zou mij wel inzicht geven over dat het werkt, maar het kan ook te ingewikkeld zijn voor veel mensen."* (A2).

Goal-setting

The majority of potential users thinks that goal-setting is important: *"Een doel hebben is belangrijk, dat je concrete dingen afspreekt. Bijvoorbeeld ik ga deze maand elke week 2 keer trainen."* (C1). However, professionals see some barriers when it comes to goal-setting: *"Mijn ervaring met doelen is wel dat ze heel vaak tegen gaan werken, vooral als mensen het zelf gaan doen. Ik heb het idee dat mensen zichzelf vaak overschatten over wat ze gaan doen of kunnen."* (P3). Furthermore, professionals expressed their doubts about the addition of goal-setting, because there are no consequences when the goal is not achieved: *"Ik ben er niet zo heel enthousiast over, omdat het een leeg doel is: er hangt niets aan vast. Wat levert het me op en wat verlies ik als ik het niet doe? Ik weet niet of dat werkt."* (P4). Professionals are slightly more positive about goal-setting if they can formulate the goal together with the patient: *"Als ik als huisarts deze app zou inzetten, zou ik met mensen willen afspreken: wat stellen wij nu samen als doel ten opzichte van het alcohol gebruik."* (P5).

Storyline

Some participants showed a positive attitude towards a simplified version of a storyline: *"Zo'n visuele weg vind ik wel leuk."* (A2). However, a whole game shell around the training was mentioned as undesirable: *"Ik denk dat je dan hele andere verwachtingen hebt, dat je dan meer richting entertainment gaat dan wat het nu is."* (A1). According to participants, this could even be detrimental to motivation: *"Dan ligt er een verwachting van het moet leuk en uitdagend zijn, en als dat niet bevestigd wordt raak je misschien de motivatie kwijt."* (A1).

Challenge

A few participants mentioned that a challenge could be motivating, although the majority named the disadvantages: *"Ik ben bang dat dit teveel teleurstelling in de hand zou werken."* (A2). Besides, they described it would become too much: *"Ik denk dat dat te ingewikkeld wordt.*" (A3), but possibly they would use it when they are familiar with the app: *"Ik denk dat ik dit zou gebruiken na 2 of 3 weken, als ik het gevoel heb dat ik grip heb op die app."* (A2). Furthermore, it was mentioned that it might enhance motivation if users can compete with others: *"Alleen een uitdaging met jezelf uitgaan blijft lastig. Als je dit ook met anderen kan doen zou dat nog een extra motivatie zijn denk ik."* (P4).

Motivational agents

The game-element that was described as least positive was motivational agents. In general, participants had a negative attitude towards these virtual coaches. Some even indicated that it would annoy them: *"Dat vind ik verschrikkelijk. Ik vind het nep en irritant."* (A3). Motivational agents were also described as childish: "*Dat vind ik wel erg kinderachtig."* (P4), and more suitable for younger target groups: *"Misschien voor andere jongere doelgroepen."* (C3). Furthermore, participants had the feeling that they did not need a virtual coach, because the task was relatively simple and easy: *"Dan denk ik waarom moet ik een coach nodig hebben om plaatjes te vegen."* (C3).

Other persuasive features

Although participants in general had a positive attitude towards the use of gamification, they indicated that the app should stay simple: *"Maar ook niet teveel [spelelementen], het moet simpel blijven."* (P2). Besides, it was named that the focus should be on the training itself. Therefore, transparency about the goal of the training was mentioned as important: "*Gamification aspecten moeten niet verkeerde verwachtingen creëren."* (A1).

According to participants, it would be desired that users can choose whether they want to include certain elements in the app or not: *"Het mooiste zou zijn dat alles een optie is, dat je zelf kunt kiezen of je het wel of niet wilt zien of doen."* (A2). Other important points were that many participants would like to have a reminder: *"... dat de app je om de zoveel tijd waarschuwt dat je hem moet gebruiken door een reminder of pushbericht."* (A1).

Requirements

The outcomes of the interviews were translated into user requirements. For example, the user expression *"Ik vind dat het swipen niet snel genoeg kan, er zit teveel tijd tussen de plaatjes"* was translated into the requirement "*In de training sessies zit er zo min mogelijk tijd tussen de opeenvolgende plaatjes."* All user requirements can be found in Table 6.

Table 6.

User-generated requirements of the new Breindebaas app

User Requirements
1. The app contains an information page including the following aspects: - Link to the website www.tactus.nl/breindebaas for more information about the effect and aim of the training and the results of the pilot study. - Instruction to watch the video - Disclaimer (*explaining the pictures could possibly be a trigger and advise to contact GP or Tactus Addiction Institute if user thinks more help is needed)* - Privacy
2. The app contains an option menu in which participants can switch features on or off
3. The zooming feature in the app is stronger *(pictures swiped towards the user become larger and pictures swiped away from the user become smaller)*
4. The app contains a database in which users can select pictures of alcoholic and non-alcoholic beverages (minimum X and maximum Y)
5. The app is visually attractive and simple
6. The app contains (game)-elements that provide positive reinforcement and feedback
7. In the training sessions, the time interval between the pictures is reduced to a minimum
8. The app gives users insight into their progress of training sessions and alcohol consumption

Besides the user requirements, there were several requirements created by the researchers, such as the inclusion of a bias measurement at baseline and after an X number of training sessions. Furthermore, the app should have a back-end to which the researchers have access for data extraction. The requirements generated by the researchers can be found in Table 7.

Table 7.

Requirements of the new Breindebaas app generated by the researchers

Research-based requirements
1. In the app there must be space for a short video (prior to the training) and there should be a possibility to add this video later without the app having to be completely rebuilt
2. The app contains a bias measurement before the first session and after an X number of sessions
3. The app contains the possibility for the researchers to fill the database with pictures
4. The app contains an option menu, including: - Reminders (yes/no, how often, allow without WIFI connection) - Ability to change the selected of pictures - Sounds on/off and choose sounds - Adjust the font size
5. The app asks users to fill in their alcohol consumption of the past days before each session
6. The app contains a back-end that can be accessed by the researchers for data extraction

Discussion A: *From User Expressions to User Requirements*

Main findings

The research question of sub study A was: *What are the needs and wishes of potential users and professionals regarding the Breindebaas app and which adjustments have to be made in the app according to their perspective?* When looking at the interviews in general, it appeared that all participants had a positive attitude towards the app. Participants were satisfied with the simple and user-friendly design, but experienced the training as somewhat boring. Several points for improvements were named, which were translated into user requirements.

Interestingly, the results of the current study confirm the findings of the pilot study of Somsen (2017), in which a short user evaluation was conducted using open-ended questions. In both the pilot study and the current study, the training was described as boring and monotonous and there were doubts among users about the effectiveness of the training. The points for improvement named in the pilot study were that there should be a greater variety of pictures, a shorter time interval between the pictures and the option to personalize the picture set. Furthermore, participants in the pilot study indicated they would like to see more game-elements and improved reminders. These findings were all confirmed by the current study.

Besides the confirmation of the findings of the pilot study, there were also new findings that emerged from the current study. The current study showed that both potential users and professionals had a positive attitude towards adding game-elements, in which performance feedback and positive reinforcement were mentioned as most desirable. Furthermore, users expressed the need to have more insight into their progress. From the interviews it appeared that the adjustment of certain features and the addition of game-elements would make users experience the training as less tedious and thus would increase their motivation to train.

Despite the positive attitude towards the addition of game-elements, the current study made it clear that not too many game-elements should be added in the app. It seemed to be important that the app stays simple and clear, and will not be transformed into a complete game. This is in line with the literature, stating that serious games should not be directly compared with entertainment games (Buday, Baranowski, & Thompson, 2012). This can create unmet expectations that can lead to disappointment or demotivation. This finding can be related to the Self-Determination Theory (SDT) (Ryan & Deci, 2000). The SDT states that there are three basic needs that need to be satisfied in order to foster intrinsic motivation:

autonomy, relatedness and competence (Ryan & Deci, 2000). The SDT suggest that when people are intrinsically motivated, but this behaviour is controlled by external rewards, it can undermine people's autonomy. Thus, this theory supports the finding that too many external rewards, including game-elements, can lead to demotivation.

Another important finding of the current study was that both potential users and professionals showed the need for more information about aim and effect of the training. It appeared that this should be more emphasized in the app, as well as in a new introduction video. Wiers & Salemink (2015) support this finding by the suggestion that it is important to explain the rationale behind repetitive training. This can address the lack of understanding and by explaining why repetitive training is important, the training can possibly make more sense. In anxiety patients, it has already been shown that the results achieved with cognitive training are better if the rationale is explained to the patients in a credible and understanding way (Beard et al., 2012). Providing users with more information about aim and effect seems to be equally important as adding game-elements, while previous research suggests that giving meaning to a task improves motivation of users to the same extent as rewarding them with points (Mekler, Brühlmann, Opwis, & Tuch, 2013). The need for more information about aim and effect can also be related to the need for competence of the SDT, while this theory suggests that promoting feelings of efficacy can facilitate intrinsic motivation (Ryan & Deci, 2000). Furthermore, the SDT states that providing positive feedback and rewards, which were desired by the potential users in the current study, can as well contribute to a feeling of competence and in turn enhance intrinsic motivation (Ryan & Deci, 2000).

Lastly, the interviews showed that the images of alcoholic beverages can be a trigger for people in the first phase of recovery. While users perform the training individually without the attendance of a supervisor, they should be warned in the app for the possible risks of being confronted with alcoholic beverages.

Relating the results to the Persuasive System Design (PSD) model

The current study explored which persuasive elements can contribute to improved motivation to train in the Breindebaas app, or in other words, *adherence*. Therefore, it can be interesting to relate the interview outcomes to the Persuasive System Design (PSD) model (Figure 1.2) of Oinas-Kukkonen and Harjumaa (2009).

Primary task support

The first category of the PSD-model is the *primary task support*, which focuses on supporting the user in carrying out the primary task. One design principle of this category that clearly arose in the interviews is *personalization*. Users often named that not all pictures of the current database were relevant to them and they would prefer to select the pictures of beverages themselves. The PSD-model suggests that this would be beneficial, stating that the persuasiveness of a system can be enhanced by offering personalized content. This is confirmed by O'Keefe (2008), who stated that motivation can be increased by emphasizing personal relevance. These findings suggest that letting users select their own pictures can possibly enhance the motivation to train in the app. On the other hand, it should be taken into account that personalization of the training can also have negative consequences, such as users who still remain sensitive for alcoholic drinks that were not selected in the training. However, in a study of Wiers et al. (2011), it was found that the retrained effects on the automatic approach tendencies could be generalized to an untrained picture set.

Another finding of the interviews was that participants would like to have more insight into their own behaviour by means of performance feedback. This can be linked to the design principles *simulation* (i.e. improved persuasiveness when link between cause and effect of own behaviour can be observed) and the design principle *self-monitoring* (i.e. system should enable users to keep track of their own performance). This finding is in line with earlier studies, which showed that positive performance feedback can enhance intrinsic motivation (Deci & Ryan, 1985; Harackiewicz, 1979).

In the interviews, the simplicity and straightforwardness of the Breindebaas app were regularly emphasized as important assets. This finding can be related to the design principle *reduction,* which states that a system should reduce complex behaviour into simple tasks. The design principle *tailoring* can be related to (ex)-alcohol clients, who mentioned that they are a little slower in understanding. They expressed the need for very simple and clear information. Therefore, information provided by the system should be tailored to the user group.

The last principle regarding the primary task category that arose from the interviews was *rehearsal.* Besides the fact that the training itself has a repetitive nature, users mentioned that they want to hear more often that they have to train repeatedly. According to the PSD-model, using *rehearsal* can enable users to change their attitude or behaviour in the real word. The design principle that did not arise from the interviews was *tunnelling,* which includes that the user should be guided through a process. A possible explanation for why this principle did not arise in the interviews is that the app in itself is already a primitive form of tunnelling.

Dialogue support

The second category of the PSD-model is the *dialogue support*, which concerns the interaction between the user and the system. The design principle *rewards* was often named in the interviews, in which several users mentioned that they would like to receive a simple reward for their performance. Furthermore, professionals indicate that clients are sensitive to compliments and positive reinforcement, which can be related to the design principle *praise.* According to the PSD-model, praising and rewards can make users more open to persuasion. The persuasive design principles *reminders* and *liking* were also found in the interviews. Users indicated that they want the system to regularly remind them to perform a new training and mentioned that a visually attractive app is important to them.

The design principles that could not be related to the interviews are *similarity* (i.e. imitate users and remind them of themselves)*, suggestion* (i.e. system should suggest to carry out certain behaviours) and *social role* (i.e. system should adapt a social role). The design principle *suggestion* can possibly be related to the system suggesting that the user has to train again. The other two design principles are perceived as not applicable.

Credibility support

The third category of the PSD-model is *credibility support*, which refers to designing a system that is credible and therefore more persuasive. The interviews showed that there were some doubts about the effectiveness of the training. Professionals named it more likely that they would implement the app if it was proven to be effective or if they could read something about the preliminary results. This can be related to the design principle *third-party endorsement*. Furthermore, the design principles *trustworthiness* and *expertise* relate to the expressed need for information about aim and effect shown in the interviews. According to the PSD-model, providing information, knowledge and competence can increase the persuasive powers of a system.

The design principles *real-word feel* and *authority* suggest that a system should provide information of the organization behind the system. This can be related to the app because it was developed by Tactus Addiction Institute. The users' satisfaction of the look and style of the app that arose in the interviews, can be related to the design principle *surface credibility.* This principle states that a system should have a competent look and feel.

According to the design principle *verifiability*, the accuracy of the system content should be verified by outside sources. This was not named in the interviews. However, it is included as requirement, suggesting to include a link to the website of Breindebaas.

Social support

The fourth category of the PSD-model is *social support*, focusing on using social support within the system to increase persuasiveness. In the interviews, some users mentioned that they would like to compare their response times with that of other users. This finding can be related to the design principles *social comparison*, *social learning*, *social facilitation* and *competition*. According to the PSD-model, letting users compare their own performance with the performance of others can increase the motivation. Possibly, this finding can also be related to the design principle *normative influence,* because it can make them aware of the fact that others who have the same goal are training in the app as well. This finding is supported by the SDT, with in particular the need for relatedness, suggesting that fulfilling the need to be connected can enhance intrinsic motivation (Ryan & Deci, 2000).

Although these *social support* elements are perceived as motivating and persuasive, it should be taken into account that it can possibly give users the feeling that privacy and anonymity are harmed. Privacy and anonymity are perceived as very important assets and thus should be carefully considered when designing a certain feature. This can for example be done by letting users share their performances by using anonymous user names.

The design principles *recognition* and *cooperation* from the category *social support* could not be related to the interviews. The design principle *cooperation* can be perceived as not applicable, while the training is a relatively simple task that should be performed individually. The design principle *recognition,* which includes that the system should provide public recognition for users performing the target behaviour*,* could also not be related to the interviews. Potential users of the app are people who consume excessive amounts of alcohol and might experience feelings of shame (O'Connor et al., 1994). Therefore, it is possible that this design principle in the current situation would not contribute to a more persuasive system.

Comparing the results of the current study with the PSD-model made it clear that the main findings of the interviews are in line with persuasive design principles. Therefore, including these elements in the new Breindebaas app seems to be promising for improving adherence.

Subgroup similarities and differences

In general, the statements of the different subgroups were in the same direction. User expressions were generally the same between the subgroups and no clear differences were found with regard to the points for improvement. However, an interesting statement was only expressed by the sub group '(ex)-alcohol clients of addiction treatment'. Interviewees in this

sub group indicated that the pictures of the alcoholic beverages could be a trigger for people who have or did have an alcohol addiction. They mentioned that especially in the first phase of alcohol addiction recovery people are advised to stay away from alcohol, but in the app they will be constantly confronted with alcoholic beverages. The interview outcomes showed that (ex)-clients of alcohol addiction treatment could almost smell and taste the alcohol by only seeing the picture of an alcoholic beverage. Several interviewees from this sub group mentioned that the pictures could possibly be a trigger.

As far as is known, there are no studies yet that describe the possible risks of Cognitive Bias Modification. However, in exposure therapy, in which patients are repeatedly exposed to a feared stimulus or situation, there is always a supportive therapist present to prevent any negative consequences (Davis, Ressler, Rothbaum, & Richardson, 2006). Users in the Breindebaas app will train individually, independent of treatment, which makes supervision not possible. Therefore, a disclaimer should be included in the app, to inform people about the possible risks.

Another interesting statement, that was only expressed by professionals, was that they had some doubts about goal-setting. They mentioned overestimation could play a role. Strecher et al. (1995) confirm that goal-setting does indeed not always instigate behaviour change. Self-set goals can even be counterproductive, especially when a person is not committed. They suggest using a counsellor when goals are set too high or too low, as they have a more realistic view of the goals to be set (Strecher et al., 1995). However, including a supervisor is in this case is no option, as the app will also be used independent of treatment. To prevent any negative consequences, it is preferred to not include goal-setting in the app.

Limitations & strengths

With regard to the current study, several limitations can be named. The first limitation of the current study is that the sample size of the sub groups can be perceived as relatively low. Different sub groups were involved, including (ex)-clients of alcohol addiction treatment (n=4), people from the general population who wanted to reduce alcohol intake (n=3), and professionals (n=5). The small sample sizes could be related to the fact that no clear differences between the subgroups could be found. When interviewing larger samples, it is possible that more differences between the sub groups would arise and subsequently more sub group specific information could be found. However, the current study meets the requirement of at least three participants per sub group, as recommended by Onwuegbuzie & Leech (2007). The total sample (n=12) was perceived as a reasonable number for this qualitative

interview study. While completing the last interviews, no new information emerged from the interviews. This indicates that data saturation was achieved (Guest, Bunce, & Johsnon, 2006).

The second limitation is that the Breindebaas app aims to be widely applicable among different target groups. However, it can be debated whether one app can meet the needs of all these groups. Due to the current circumstances and budget it is only possible to develop and design a single app. On the other side, it is possible that the heterogeneity of the user groups in the Breindebaas app will be less of a problem, because of the relative simple training task and the optional settings that will be included in the new version of the app. By means of regular user evaluations, the needs and wishes of the different target groups should be taken into account as much as possible.

The third and last limitation of the current study is that the interviews were conducted by two different researchers. Therefore, the interview style and interview skills could possibly have influenced the participants' responses. It is not clear to which extent this has caused an interviewer bias. However, the inclusion of different interviewers could also be perceived as a strength, because it could have led to obtaining more heterogeneous data.

Several other strengths of the current study can be named. The first strength is the qualitative approach. By means of semi-structured interviews, the researchers were not restricted to a strict scheme, which led to obtaining relevant and detailed information. The second strength of the current study is that multiple sub groups were included. The current study served as a needs assessment and made sure that different stakeholders were involved at an early stage in the design process, aiming to minimize the chance of user- and implementation problems at a later stage (Rogers, Sharp, & Preece, 2011). The third strength is that the current study had a theory-based approach, by including the Self-Determination Theory, Persuasive System Design Model and gamification theory. The fourth and last strength is that the current study was based on an evidence-based framework, in which the CeHRes Roadmap, including UCD principles, served as a guideline.

Recommendations

A recommendation that can be made for the further redevelopment project of the Breindebaas is to keep the stakeholders involved throughout the entire design process. On the short term, this means that when the first prototypes are developed, a user evaluation should be performed. This advice is supported by the CeHRes roadmap (Van Velsen et al., 2012), according to which a formative evaluation should take place after each phase. It is expected that detecting and solving problems at an early stage will foster successful implementation.

With regard to future app designers, it is recommended to adopt a User-Centered Design (UCD) approach in designing smartphone apps. Adopting a UCD approach is perceived as a good way to verify literature findings and examine how to develop an app that connects well to the prospective users. The current study showed that using a UCD approach can be helpful in formulating requirements for a health-related smartphone app.

Another recommendation is that future *serious game* developers should take into account that a serious game is not the same as an entertainment game, and therefore should not be presented as such. This was already stated in gamification literature and confirmed by the users in the current study. The concept of a 'serious game' is twofold and combines serious aspects with game aspects, in which it is important to find a good balance. Brown et al. (2016) state that the level of fun usually lies somewhere in between the regular task (mainly boring) and the entertainment game (mainly fun). More research is needed to explore the balance between serious aspects and the addition of game-elements. Although adding gamification can improve the motivation to train, it is clear that a basic motivation to change the problematic behaviour is needed to achieve actual behaviour change (Boendermaker, Peeters, Prins, & Wiers, 2017).

Gamification is becoming an increasingly popular topic of research (Hamari, Koivisto, & Sarsa, 2014). However, many studies did not produce any firm conclusions yet, which leads to the lack of empirical evidence (Hays, 2005). Therefore, more research is needed to explore the influence of gamification on adherence in health-related smartphone apps, and more specificly, in CBM tasks.

The current study gained insight into the needs and wishes of potential users and professionals regarding the Breindebaas app. This input was used in the formulation of requirements. In the subsequent sub study, these requirements were used to create a briefing for the designers, to create a prototype of the new Breindebaas app.

Methods B: *From Persona to Prototype*

Design

Sub study B included the value specification and design phase of the CeHRes Roadmap. In this sub study, two student teams were instructed to design a new version of the Breindebaas app. Each group received a 'design brief', based on the results of sub study A. The design brief included a persona, use-case scenario and user- and research goals. The design briefs were similar in content but presented in different formats. One team received a pictorial brief and one team received a text-based brief. The influence of the persona and scenario on process and product were examined, in which the different presentation formats were compared. The current sub study was a mixed-methods study, including focus groups, observations, a persona recall test and an expert-based usability heuristics analysis.

Participants

Participants in this sub study were second year Software Engineering students of Saxion University of Applied Sciences. As part of their studies, the students worked in teams to design and develop a prototype of the new Breindebaas app as an external assignment (12 EC) in collaboration with Tactus Addiction Institute. The students were divided in 2 design teams, consisting of four members each. All participating students (n=8) were male. During the design process, students were supervised by a Software Engineering coach, who assisted them in both process and product. Furthermore, students could consult an expert, who was consultant in the field of human-media interaction. Lastly, there was the client from the organization Tactus Addiction Institute, to whom students could reach out to whenever they had questions about the briefing and requirements.

Materials

Persona and scenario

In the current study, a persona was used. This is a fictional potential user, aimed to enhance user-centered thinking in the design process (Pruitt & Adlin, 2010). On the basis of the findings of sub study A, the persona *Robert* was created (Figure 2.1). The persona was created by using the conceptual user model (LeRouge, Ma, Sneha & Tolle, 2013), which contained the categories demographics, technical aspects and healthcare specifics. The demographic characteristics of the persona were based on the mean values of the pilot study of Somsen (2017), in which most participants were high-educated men with an average age of 52 years

old. The technical aspects contained Robert's attitude towards technology, which included an open positive attitude but not much technical knowledge. Lastly, the category healthcare specifics included information about Robert's alcohol consumption. This section outlined that he overconsumed alcohol, was not able to reduce or stop this consumption and he experienced a high threshold to contact the GP. Besides this information, the persona form also included a portrait picture of Robert. The complete persona form can be found in Appendix E.

Figure 2.1. The persona form of Robert*.

Besides the persona, two use-case scenarios were created. The use-case scenarios provided information about how Robert used the app and which needs and wishes he had with regard to the new app. These needs and wishes were based on the results of sub study A. The use-case scenarios were the same in content, but were presented in different formats. One use-case scenario was text-based, while the other was pictorial (Figure 2.2). This approach was based on a study of Long (2009). The complete text-based scenario can be found in Appendix F. The complete pictorial scenario can be found in Appendix G.

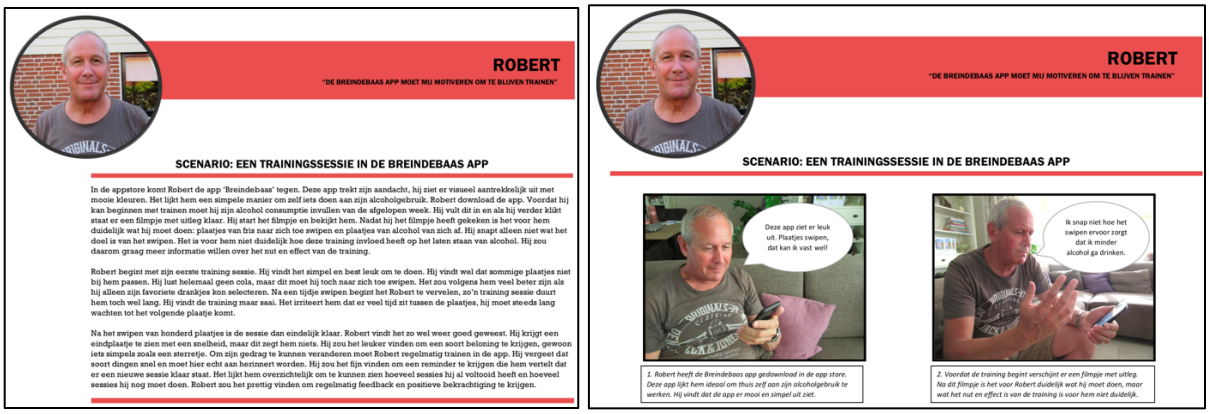

Figure 2.2. Respectively the text-based scenario and the pictorial scenario*.

** Images are used for illustration purposes only, this is not an actual user of the app.*

Procedure

Briefing

First, all students received a short plenary briefing about the Breindebaas app and about the concept Cognitive Bias Modification. After the plenary briefing, the students were separated into their teams and received the pre-prepared persona including either the pictorial scenario or the text-based scenario. Each briefing also contained the requirements, which were formulated in terms of 'user-goals' and 'research-goals' (Appendix H). User-goals included the user requirements, such as that the user wants to have more insight into his progress. The research-goals were requirements formulated by the researchers, such as the inclusion of a bias measurement in the app.

Students were asked to read the design brief and were allowed to pose questions to the researchers. By answering the questions, only the necessary was given. The requirements were further explained, but the researchers remained neutral and did not provide directions or ideas. Some requirements were formulated relatively broad, to stimulate students to come up with creative design solutions themselves. Each team was asked to focus on their own design brief and not share the information with the other group. Students had ten weeks to develop a prototype of the new Breindebaas app. Due to time limitations, the current study focused on the low fidelity prototypes, that were delivered halfway through the project (i.e. after five weeks).

The focus groups

In the fifth week of the project, each student team was instructed to give a short presentation of their developed prototype. After the presentation of the prototypes by the students, a focus group was conducted with each team, consisting mainly of self-reports. Focus groups can stimulate group discussions, which would provide more information than one-to-one interviews (Kitzinger, 1995). Furthermore, focus groups were perceived as time-efficient and allowed team members to comment on each other. Students were informed that the focus groups were recorded with a voice recorder. All students signed informed consent (Appendix I). In the focus groups, questions were asked about the approach they used to achieve their design solution. Students were also asked to name several challenges they faced within the project and how they were overcome. Furthermore, students were asked to describe the role of the persona and scenario in the design process and to which extent the design brief influenced the process and the product. Students were encouraged to give concrete examples. With regard to the different design briefs, both teams confirmed that very minimal information was

shared between the two teams. The complete question list that was used in the focus groups can be found in Appendix J. The duration of each focus group was approximately 15 minutes.

Recall test

A persona recall test was given to the students without prior notice three days before the presentation of their prototypes. This recall test, based on the study of Long (2009), aimed to examine how many details of the persona students could remember and if there were any clear differences between the two groups. Students were given five minutes to fill out the form and provide as much information as they could recall. The form contained four topics: demographics, alcohol consumption, attitude towards technology and user needs and wishes in the app. The persona recall test form can be found in Appendix K.

Usability heuristics

After five weeks, each team presented their working prototype to the researchers. Researchers performed a usability assessment for each prototype, using Nielsen's Usability Heuristics (Nielsen, 1995). This assessment was done to determine any differences between the prototypes with regard to usability. The ten heuristics were used as a checklist, assessing each prototype against each heuristic. When assessing the prototype for example to the heuristic *flexibility and efficiency of use,* one point was given if the prototype contained one feature that supported this heuristic. Two points were given when the prototype contained two or more features that supported this heuristic. When the prototype contained no features supporting the heuristic, zero points were given. After scoring all ten usability heuristics, this process was repeated for the prototype of the other team. The assessment was done individually by three researchers. The usability heuristics scoring form can be found in Appendix L.

Observations

The correspondence between the teams and the expert, coach and client were recorded. The expert, coach and client were asked to rapport their observations per week in the third, fourth and fifth week of the project. In these weeks, they received an e-mail with a link to a short online questionnaire. The weekly questionnaire contained questions about whether they have had contact with each team, how often and what was discussed in that particular week (Appendix M). In the fifth week, when the first prototypes were finished, an additional questionnaire was sent. This questionnaire was more extensive and specific, containing questions about the use of the persona and scenarios in the design process and (their influence

on) the process and product (Appendix N). This questionnaire was only sent at the end, to prevent influencing the expert, coach and client to instruct the students to use the persona and scenarios more. All observers did not explicitly tell the teams to use the persona and scenarios more often.

Analysis

Focus groups

The audio recordings from the focus groups were transcribed verbatim (Poland, 1995). Afterwards, thematic analysis was conducted (Braun & Clarke, 2006). This process started with the familiarization with the data and the generation of initial codes. Then, the codes were transformed into themes and the potential themes were reviewed. The reviewing phase included determining whether it was a theme, and which were the boundaries of a certain theme. Lastly, the themes were defined and named. The definitions and labels for the created themes of the focus groups can be found in Appendix O.

Recall test

The retrieved data from the recall test were sorted on four categories: demographics, alcohol consumption, attitude towards technology and requirements. Each category was divided into subcategories, which were all included in a scoring table (Appendix P). For example, the category alcohol consumption was divided in the sub categories 'type of alcohol', 'number of glasses' and 'desire to reduce alcohol consumption'. The answers of the students were scored on these sub categories. When an answer was correct, it was scored with 2 points. When an answer was almost correct or in the right category, it was scored with 1 point. When an answer was incorrect or missing, it was scored with 0 points. For example, the answer *'Robert drinks 4-6 glasses of wine per day'*, was scored as following: type of drink is correct (2 points), number of glasses is not exactly correct but close to the right answer (1 point), and the desire to reduce consumption is missing (0 points). This total of three points was divided by three to calculate the mean score on the category 'alcohol consumption'. Afterwards, the scores of all team members were computed to calculate the total team scores.

The requirements were scored by assigning the whole team with 1 point for each correct requirement. This was a cumulative score, in which both uniquely and repeatedly named correct requirements for all team members were added up to calculate the team score. While there were 4 team members and a total of 10 requirements, the maximum team score was 40. The mean scores of the requirements were not calculated and depicted, as this would

give no adequate overview of the considerable difference between the two teams.

Nielsen's usability heuristics

During the usability assessment, three heuristics were evaluated as not applicable by the researchers (i.e. user control & freedom, error prevention, and error recovery). Therefore, the analysis was done for the seven remaining heuristics. The researchers assessed every heuristic with the score 0, 1 or 2. These scores were put in a table. The mean score for each heuristic was calculated. The sum of these scores made the total usability score per team. Afterwards, the results were presented in a column graph, to visualize the differences between the two design teams.

Observations

On the observational data, thematic analysis was conducted (Braun & Clarke, 2006). This process started with the familiarization with the data and the generation of initial codes. Generating codes was both deductive and inductive (Joffe & Yardley, 2004). Then, the codes were transformed into themes and the potential themes were reviewed. The reviewing phase included determining whether it was a theme, and which were the boundaries of a certain theme. Lastly, the themes were defined and named. The definitions and labels for the created themes of the observations can be found in Appendix Q.

Results B: *From Persona to Prototype*

Focus groups

Challenges

Both teams described that they have encountered some challenges during the design process. Team 1 mentioned that the challenges were mainly related to the technical aspects of the project: *"De gebruikte technieken sowieso, dat was voor ons een uitdaging."* Team 2 also described that they encountered a technical challenge: *"We keken eerst of de code die we kregen wel bruikbaar was, uiteindelijk was hij te oud voor ons."* They also described how they solved this challenge: "*Dus toen hebben we een andere methode gekozen. We hebben nieuwe programeer taal gekozen eigenlijk. En niemand van ons had daar volgens mij ervaring mee."* (Team 2). Team 2 also mentioned that programming the swiping feature in the app was a challenge: *"Het swipe-gedeelte, dat is niet zwart-wit programmeren. […] Het is niet dat je zegt van 'swipe' dat doet ie even voor jou, je moet echt helemaal aangeven hier is je vinger en waar je vinger is daar moet de afbeelding naar toe gaan. Daar zijn we nu nog steeds mee bezig en daar lopen we nu nog steeds tegen aan."*

Role of the persona in the design process

Insight into user needs

Both teams showed a positive attitude towards the use of the persona in the design process. For both teams it was the first time that they worked with personas in a design assignment. Team 1 mentioned that it gave them more insight into the actual user: *"Het was op zich wel handig dat je inzicht hebt in iemand die de app ook echt heeft gebruikt. Wat hij vervelend vond en wat hij vond dat beter kon, zodat je daar meer op kan inspelen met de nieuwe versie."* They described that this stimulated them to use this information in the design: *"En nu heb je echt de input van de gebruiker die je ook echt moet gebruiken."* (Team 1).

Team 2 made it clear that the persona 'Robert' has played a large role in their design process: *"Hij was wel de kernpersoon waar we naar keken toen wij de app aan het bouwen waren."*. In accordance with Team 1, they described that the persona has stimulated them to picture the actual user and take his needs into account: *"Je krijgt er makkelijker een beeld bij en kan je beter inleven in de gebruiker. Daardoor ga je er ook automatisch rekening mee houden."* (Team 2). They mentioned this enabled them to see the app from the users' perspective: "*Je kan je iets meer inleven in hoe hij de app gebruikt, want je kijkt er zelf natuurlijk heel anders tegen aan."* (Team 2).

Usability

Team 2 mentioned that the persona has increased their focus on usability: *"Vooral de gebruiksvriendelijkheid, ik denk dat het dat het meeste is. Dat je daar gewoon heel erg rekening mee gaat houden […] Ja, daar ben je vanaf het begin af aan al eigenlijk mee bezig, vanaf het design en de mock-ups."* According to them, their prototype would be different without having used the persona: "*Ja dan was er wel iets anders uitgekomen. Niet zo gebruiksvriendelijk denk ik."* (Team 2). They mentioned that without a persona, they normally design from their own perspective: "*Dan hadden we het meer ontworpen zoals we het zelf zouden gebruiken. Die uitleg is dan bijvoorbeeld niet nodig, want we snappen wel hoe het werkt.*" (Team 2). The persona made them realize that especially older target groups are not that familiar with technology as themselves: "*Je bent wat jonger en je bent wel gewend hoe apps werken, dan kun je toch zien hoe dat dan verschilt zeg maar."* (Team 2). Although Team 1 showed that they are not convinced that the persona has increased usability, they mention that it could have made a difference: "*Ik denk dat je daar altijd wel rekening mee moet houden met de gebruiksvriendelijkheid. […] Er zit misschien onbewust wel verschil tussen."*

Less assumptions

According to Team 1, software developers often forget to take the needs of the user into account: *"Ze denken dan helemaal niet aan de gebruiker, ze nemen altijd aannames: dit zal de gebruiker vast wel leuk vinden."* An advantage of using the persona according to Team 1 was that they had to make less assumptions: *"Wat mij wel opviel is dat we veel minder aannames hoefden te maken, want hij had duidelijk uitgelegd wat hij wel wilde en wat hij niet fijn vindt."* This was a positive difference compared to working without a persona: *"Normaal moet je je eigen aannames er eigenlijk aan gaan toevoegen, en 9 van de 10 keer zijn dat verkeerde aannames."* They indicated that not having to make assumptions led to a more successful design: "*Dus nu is het ontwerp bijna in een keer goed zeg maar, dat is gewoon veel fijner.*" (Team 1).

Detecting design flaws at an early stage

Team 2 described that the use of the persona supported them in detecting problems at an early stage: "*Nu zie je dingen al veel eerder, waar je normaal gesproken pas halverwege het project achter komt. Of als het af is pas.*" (Team 2). An example that was given was the information and explanation in the app: *"Vooral bijvoorbeeld het nut en het doel, dat dat gewoon echt goed duidelijk moet zijn."* (Team 2). An example mentioned by Team 1 was that

they made features more adjustable: *"Zoals nu hebben we dat je de lettergrootte groter en kleiner kunt maken. Als je tieners hebt, dan heb je dat meestal niet nodig, één lettergrootte is goed. Maar voor ouderen wil je dat wel kunnen aanpassen"*.

The teams mentioned some other examples of design choices that were based on the persona, such as the option for users to select their own pictures: *"Sommige mensen hebben bijvoorbeeld helemaal niets met cola en dat moeten ze dan naar zich toe swipen. Dat is echt iets wat we daaruit hebben gehaald. Dat is iets waar je zelf niet bij nadenkt."* (Team 2). They also based another design choice on the persona: "*Dat hij positieve bekrachtiging wil. Hij wilde graag weten dat hij het beter zou gaan doen vooral. Daarom hebben we de app nu animaties in zitten, als je klaar bent enzo."* (Team 2). Lastly, the persona stimulated them in maintaining the simple design: "*Dat we de stijl van de app hetzelfde hebben gelaten, want dat vond hij er wel goed uit zien. […] Dat het er gewoon simpel uit moet zien."* (Team 2).

Interestingly, not all the wishes of the persona Robert were exactly implemented in the app. Team 1 gave an example of a design choice that was made intentionally adjustable: *"Hij vond dat [het elkaar opvolgen van de plaatjes] te lang duren, maar misschien vinden andere mensen dat niet. Dus we dachten we laten de keuze bij Tactus zelf, daarom hebben we dat instelbaar gemaakt."*

Time-saving

Another advantage of using the persona that was mentioned, was that it was experienced as time-saving: "*Dat we [zonder persona] zelf veel langer moesten nadenken en veel langer met dit onderzoek [naar gebruikerswensen] waren bezig geweest. Dat zou ook kunnen zijn gebeurd. Dit kan ook wel tijd hebben bespaard."* (Team 2). They indicated that the persona made things more clear from the beginning: *"Ik vond vooral dat het vooraf gelijk duidelijk is, dat vond ik wel echt een groot pluspunt."* (Team 2).

Involvement

Lastly, it was described that using the persona has increased their motivation. "*Vaak hadden we zoiets van als we een voldoende halen is het goed. Maar nu hebben we zoiets van, het zou mooi zijn als het echt gebruikt wordt."* (Team 2). It seemed important to them to be able to picture the actual users: "*We hebben er nu een beeld bij, voor wie het is, en dat hebben we vaak niet."* (Team 2).

Role of the scenario in the design process

At the start of the project, Team 1 received a text-based scenario and Team 2 received a pictorial scenario. Both teams indicated that they have used the scenario. Team 1 mentioned that the scenario was useful: *"Ja, dat is wel handig geweest voor de algemene doorloop van de app. Het ging er ook over hoe Robert die app gebruikte."* However, they were not sure whether the scenario was a valuable addition to the persona: *"Ik weet niet of het aan de persona een toevoeging had, maar het is wel fijn dat je in verhaalvorm hebt hoe de user de app gebruikt."* Team 2 also indicated the scenario as useful: *"Je weet dan hoe de gebruiker de app ervaart en hoe hij gewend is om er doorheen te klikken."* They mentioned this was something they would normally not take into account: *"Dit is iets waar wij nooit bij nadenken: hoe de gebruiker een app gebruikt."* (Team 2). A difference between the teams is that Team 1 seems to have used the scenario mainly in the beginning: *"Volgens mij hebben we het vooral gebruikt voor de user stories maken en daar requirements uit proberen te halen."*, while Team 2 used the scenario throughout the design process: *"Ja je neemt dit ook wel mee, je gaat erover nadenken. Dan denk je gewoon weer hieraan terug, van het moet gewoon duidelijk zijn en logisch."* Team 2 indicated that the scenario stimulated them in adjusting certain features to the user: *"Van dit moet iets gedetailleerder om duidelijk te zijn voor de uiteindelijke eindgebruiker."* Team 2, that received the pictorial scenario, was asked whether they thought a text-based scenario would have the same effects: "*Het zou ook met tekst kunnen, maar ik denk dat plaatjes beter blijven hangen. Je denkt meteen aan het beeld van waar hij tegenaan liep, en dat blijft in je hoofd zitten.*"

Influence of design brief on the process and functioning

Both teams mentioned that the design brief had a positive effect on the design process. One thing that was mentioned, was that there were less discussions: *"Ja, dan valt er gewoon niet over te discussiëren eigenlijk. De gebruiker wil dit, dan kunnen wij wel wat anders willen binnen het team, maar wij hebben daar eigenlijk niets over te zeggen."* (Team 1). This was also described by Team 2: *"We hebben heel veel discussies gehad, maar niet daarover. Het staat er gewoon duidelijk zwart op wit, je kant er niet omheen draaien."* (Team 2). Team 1 mentioned that the design brief created awareness about designing for the actual user: "*Ik denk dat iedereen er zich wel van bewust is van, dit is gewoon echt een gebruiker en ze willen dit. Nou, dan is dat zo."* Furthermore, it was described that the design brief had a positive effect on decision making: *"Ik denk dat het het maken van beslissingen juist wel makkelijker maakte. Je verwijst gewoon daar naartoe, en dan heeft de ander ook snel zoiets van ja het*

staat daar wel in, het staat gewoon op papier." (Team 2). With regard to keeping their own design brief to themselves, both teams confirmed that very minimal information was shared between the two teams.

Use of design brief in the future

Both student teams indicated that they would like to use a similar design brief again in the future. Team 2 even mentioned that they would like to work with multiple personas: *"Misschien ook voor nog wel meer gebruikers. Bijvoorbeeld van een man en een vrouw, of van verschillende leeftijden. Verschillende categorieën."* Working with user information was experienced as positive: *"Überhaupt gebruikersdata is fijn […] Klachten of opmerkingen die ze hebben over de app. Zodat je in ieder geval weet waar ze vooral tegenaan lopen en wat anders moet. Het is natuurlijk wel handig om te weten wat voor soort gebruikers je hebt." (*Team 1). The main reason was that it made it easier to take into account the needs of the user: *"Je kunt dan ook zien of het vooral jongeren zijn of vooral ouderen en wie je dan moet 'targeten' als doelgroep. Dat je daar rekening mee kan houden."* (Team 1).

Persuasive features and game-elements

While the focus groups were conducted halfway through the project, the teams were not finished with their prototype. In these five weeks, the teams seemed to have focused especially on the technical aspects of the app. As a result, not many persuasive features and game-elements were included yet. Team 1 already made a plan of which elements to include: *"Ja, we zijn van plan om er achievements in te doen. Bijvoorbeeld als iemand dan zoveel dagen minder heeft gedronken of niet heeft gedronken dat je dan 'badges' krijgt van 'goed bezig! Je bent al zoveel dagen clean."* Besides the achievements, they are planning on adding another element: *"En we wilden nog een leaderboard maken, voor de motivatie om bovenaan het leaderboard te komen. Waar je dan ook in kan kiezen om er anoniem in te staan, dan kunnen ze je gebruikersnaam niet zien. Dan kun je bij instellingen kiezen ik wil anoniem in het leaderboard of niet."* Team 2 also had plans of adding game-elements, but did not have any ideas about it yet.

Persona recall test

The persona recall test contained four categories: demographics, alcohol consumption, attitude towards technology and the requirements. Students were scored on how much they could remember about these topics. The scores per team are depicted in Figure 3.1, which shows that Team 1 scored somewhat better on the demographics and alcohol consumption and Team 2 scored somewhat better on the category attitude towards technology. Besides these subtle differences, one clear difference between the two teams arose relating to the requirements. The total number of correctly remembered requirements by Team 2 (n=12) was clearly more than the total number of correct requirements remembered by Team 1 (n=7). However, both teams did not come close to the maximum score of 40. Results show that out of the 10 requirements, Team 2 remembered more unique requirements (n=7) than Team 1 (n=4). These results are presented in Figure 3.2.

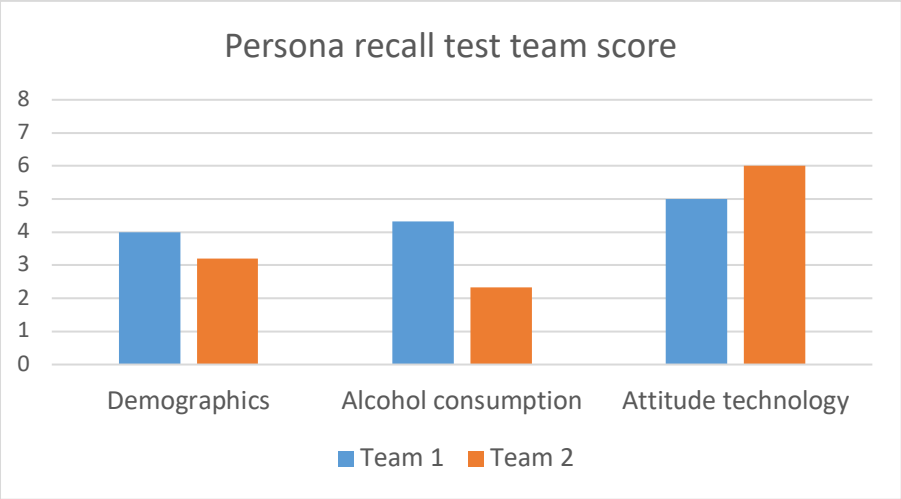

Figure 3.1. Results from the persona recall test per category divided per team.

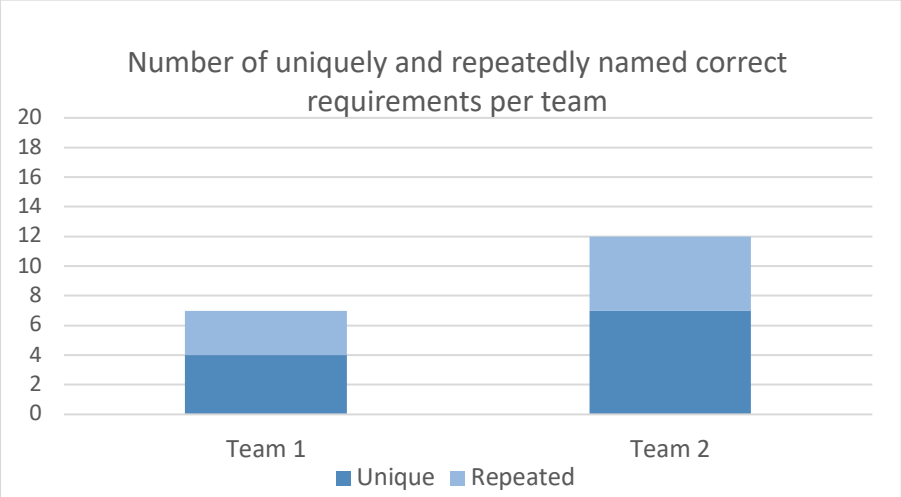

Figure 3.2. The total number of correctly remembered requirements per team.

The persona recall scores per individual are depicted in Figure 3.3. The individual scores show that all students remembered requirements better than the other categories. Although some students remembered more than others, no clear individual differences can be found.

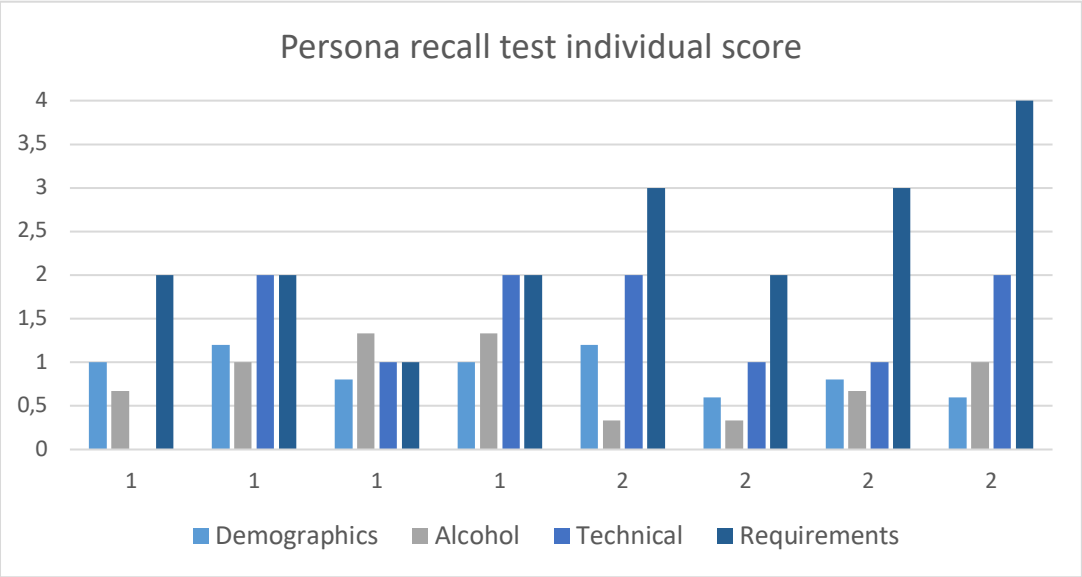

Figure 3.3. Results from the persona recall test per category divided per individual.

Figure 3.4 presents the requirements including how often they were named in the persona recall test. The requirements 'simple & clear design' and 'ability to select own pictures' were named by both teams. None of the teams mentioned the requirement to give users more insight into their progress. Figure 3.4 shows that students in Team 2 seemed to remember more unique requirements (n=7) than students in Team 1 (n=4).

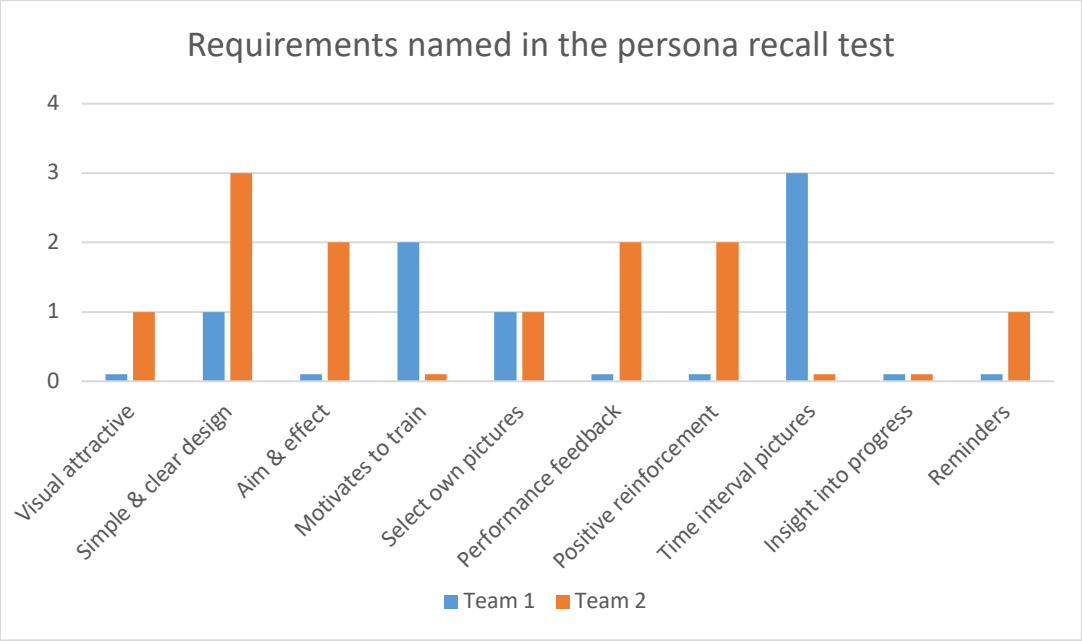

Figure 3.4. Requirements that were named in the persona recall test per team.

Usability analysis

The scores of the usability assessment can be seen in Table 8. No clear differences with regard to usability were found. Team 1 scored better on the heuristics 'recognition vs. recall' and 'help and documentation'. Team 2 scored better on the heuristics 'flexibility & efficient use of shortcuts' and 'simple and natural dialogue'. However, the differences are minimal. The total average usability score of both teams was 9.00. The average scores are depicted in Figure 4.1.

Table 8.

Heuristic assessment scores per team.

	Visibility of the system status	Speaks the users language	Consistency	Recognition vs. Recall	Flexibility & efficient	Simple and natural dialogue	Help & Documentation	Total
Team 1	1	2	2	2	1	1	1	11
	1	1	1	2	0	1	2	8
	1	2	2	1	0	2	1	9
Average	1.00	1.67	1.67	1.67	0.33	1.33	1.33	9.00
Team 2	1	2	2	0	0	2	1	9
	1	1	1	2	0	2	1	8
	1	2	2	2	2	2	0	12
Average	1.00	1.67	1.67	1.33	0.67	2	0.67	9.00

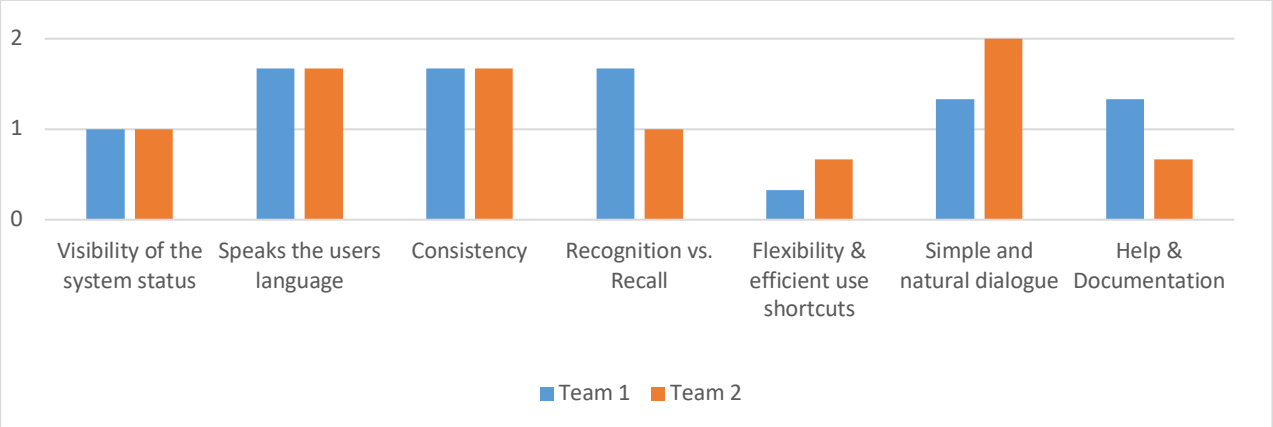

Figure 4.1. The average usability heuristic scores per team.

Observations

Weekly observations

In week 1, the coach and the client reported that they have had contact with the teams. The coach was most often in contact with teams. The ratio between face-to-face and e-mail contact was fifty-fifty. Both the coach and the client observed that students were mostly focused on the technical aspects of the app, rather than the motivational elements. The teams also had multiple questions regarding the bias measurement. Team 1 discussed some of the motivational elements with the client, describing they already had some ideas of adding tokens or a leaderboard. Team 2 was solely focused on the technical aspects of the app, so the client has stimulated them to think more about the addition of motivational elements. The coach has observed that some choices were influenced by personal experience. Furthermore, he reported that Team 2 was delayed in both functional design and technical design. An interesting observation was that at the briefing, students of both teams spontaneously mentioned to include certain features because *Robert* would want them.

In week 2, the coach, client and expert reported that they have had contact with the teams. Again, the coach was most often in contact with the teams and the ratio between face-to-face contact and e-mail contact was fifty-fifty. Although the number of appointments with the coach was the same between the two teams, it was clear that the coach discussed more topics with Team 2. The discussed topics with Team 1 included the status, pitch and feedback. The discussed topics with Team 2 included the same topics, and additionally the progress of the app, progress of the software platform that was used and the contact with the expert. Furthermore, the coach advised Team 2 to take more initiative in contact with client and expert. This week, the expert also reported to have had interaction with both teams, which was mainly about his role as consultant relating to human-media interaction. The expert advised both teams to pay attention to who uses the app and in which context (e.g. in terms of duration, situation, wishes). The expert advised Team 2 to make sure that the main purpose of the app is well supported, without too much distraction around it. They were stimulated to look more critical to the interface design (i.e. why features are positioned at a certain place).

In week 3, Team 2 had more contact with the coach and client than Team 1. There was reported more face-to-face than e-mail contact with both teams. The coach reported that besides e-mail and face-to-face contact, he also had phone contact with Team 2, which included a reminder of the pitches. The interaction in this week with both teams was mainly related to the pitches and technical aspects such as the back-end. Team 1 received advise

about the outputs of the dashboard and about the clients wishes concerning the back-end. Team 2 received advise about how to deal with new wishes of the client, infrastructure backend, privacy and body language and speed of talking during the pitch. Both teams were advised by the expert to look at the way the interaction with the app progresses and which elements in the user interface contribute to a smooth-running app.

General observations

Interaction in general

The client observed Team 1 to be clear in the communication. They asked for clarification if needed. The coach reported that Team 1 communicated especially in the consultations, but other than that they had very few questions. The expert described the interaction with both teams as short. He has occasionally indicated that he can act as consultant, but they never contacted him. The client observed Team 2 to be easy in communication and indicated she has had more interaction with this team than with Team 1. The coach mentioned there was little interaction with Team 2 outside the scheduled meetings.

Areas of support

All three observers have indicated in which areas they have supported or helped the students during the project. These results, which are depicted in Figure 5.1, show that Team 2 was more supported than Team 1 in the areas of design, planning, and use of persona and scenario. In the category 'others' it was reported that both teams were supported in making user stories, choice of framework and making an action plan.

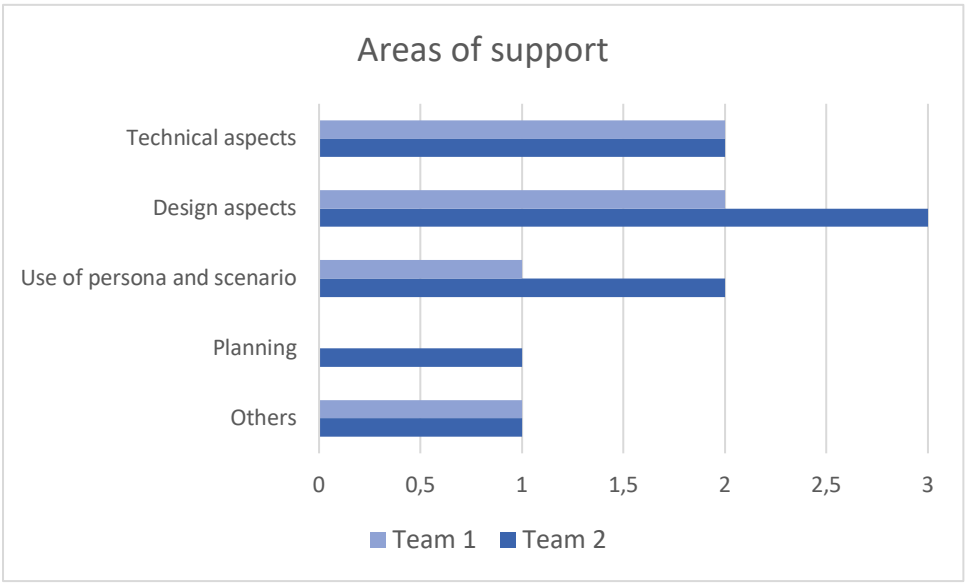

Figure 5.1. The areas in which the students were supported during the project.

Use of persona and scenario

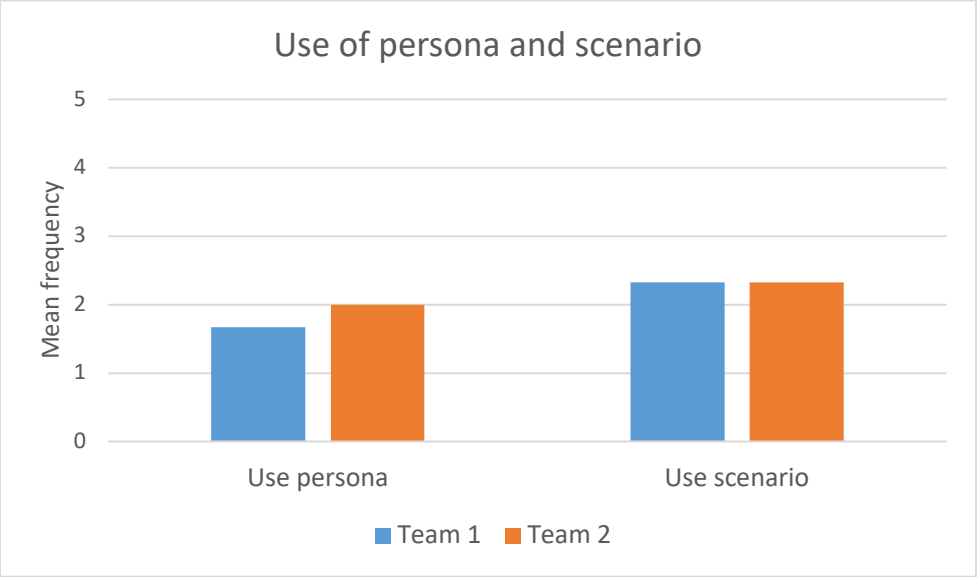

Figure 5.2. Frequency of using the persona and scenario per team according to the observers, in which (1) is very rarely, (2) rarely, (3) occasionally, (4) frequently, (5) very frequently.

Figure 5.2 shows that both teams have used the persona and scenario rarely, according to the observers. The frequency of using the scenarios seems to be the same between the two teams. The frequency of using the persona seems to be slightly higher in Team 2.

Process and collaboration

Both the expert and the client indicated that they had too little contact with the teams to observe the collaboration within the team. The coach, who was the most involved, described Team 1 as independent with a good own opinion. They are more experienced, through extracurricular activities and work. Team 1 comes with ideas, but also fills in without involving the customer in the thinking and design phase.

The coach described the functioning of Team 2 as good and mentioned that decisions are made together with mutual consultation. However, they leaned more on the coach and were not as influential in terms of contact with other stakeholders. Eventually, they looked for solutions themselves. In comparison, Team 1 interacted more easily and relaxed than Team 2.

Influence of the persona Robert and the scenario on the process

According to the coach, the persona and scenario helped Team 1 initially to get a better picture of the assignment and to better empathize with the end user. In Team 2, the persona

and scenario helped in the formulation of requirements, according to the coach, although he mentioned that the requirements were formulated weakly (i.e. not SMART). Furthermore, the client observed that once, they talked about Robert and his wishes as if he was a real person. All observers described that it is difficult to assess to which degree the design brief influenced the process. They had the idea that it was taken as starting point, but that it was not used in every meeting. All observers were asked to grade the functioning of each team. Team 1 received a mean score of 7 out of 10, while Team 2 received a mean score of 6.7 out of 10.

Prototypes

All observers were asked to name several positive- and negative points of each prototype. With regard to the prototype of Team 1, positive points were that it is multi-platform (iOS/Android), state of the art in terms of technology, it is clear how it works and it contained a good backend with multiple options for the researchers (e.g. adjusting the time between the pictures). Negative points about the prototype of Team 1 were that the texts and Key Performance Indicators (KPIs) of the backend were hardcoded without management. Furthermore, the app had a very simple look-and-feel and motivational elements were not sufficiently incorporated. According to the coach, Team 1 would do well to show interim designs before they are implemented. There is a risk that the product is not connected to the customer, so that 'rework' is required.

With regard to the prototype of Team 2, positive points were that their prototype is multi-platform (iOS/Android), includes a test phase before the training, has a neat looking frontend and the design has received extra attention (including background, rounded corners at pictures etc.). Negative points about the prototype of Team 2 were that there are no motivational elements included in the app and that the backend is not developed sufficiently yet. With regard to Team 2, there is a risk that they cannot finish up within the given time, partly due to the late start.

Influence of the persona Robert and the scenario on the prototype

According to the coach, the persona and scenario have worked positively at the start of the project for both teams. In the initial phase, it has improved empathizing with the user and it helped in formulating requirements. However, he described that the persona and scenario did not lead to specification of these requirements. The client mentioned that both teams ensured that users can choose images themselves, which responds to Robert's wish to make the app more suitable for himself. However, this was also a clear wish from them as client.

Furthermore, both teams designed a relatively simple app, which is in line with Robert's wishes. All observers were asked to grade each prototype. The prototype of Team 1 was graded with a mean score of 8 out of 10, while Team 2 was graded with a mean score of 7 out of 10.

Stimulating the use of persona and scenario

Observers were asked whether they have stimulated the teams to use the persona and scenario more often. The coach mentioned that he did not stimulate them to use the design brief more. He indicates the design brief has been processed in the beginning and then was no longer used, which he describes as unfortunate. All observers did not explicitly tell the teams to use the persona and scenarios more often.

Influence different scenarios

All observers were asked whether they thought the difference in scenarios had affected the visualization of user problems. They indicated this was difficult to assess, while they were not continuously present when the students were working on the app. In general, they think there was not much difference between the approaches. Both teams used the wishes from the scenarios to translate them in their own requirements, in which not much difference was observed between the two teams. Team 2, who received the pictorial scenario, was observed to be slightly more focused on Robert than the other team. The opinion of the coach was that a pictorial scenario works better for ICT students. He thinks it helps them to empathize with the customer's problems, even though this was partly done by the persona as well.

Other observations

It was observed that both teams have mainly been busy with the technical aspects of the app, and that it took them quite some time to get a good insight into the training and the bias measurements. Team 1 focused in particular on the backend and options for the researchers to adjust features and retrieve data. The coach mentioned that Team 1 has used existing knowledge of the group to choose NativeScript. No research has been done on alternatives. With regard to Team 2, the coach observed that they took little initiative to consult with other stakeholders (i.e. client and expert), but has improved in the process. The client noticed that in the presentation of their prototype, they showed less than they had already done.

Discussion B: *From Persona to Prototype*

Main findings

The first research question of sub study B was: *What are the influences of the persona-based design brief on the prototypes and design process?* When combining the results from the different methods applied in this study, the persona-based design brief was found to have a considerable impact on the design. From self-reports, observations, and a recall test, it appeared that the persona helped to avoid assumptions, improved insight into the 'real' user and helped in the early detection of design flaws. Furthermore, using the persona appeared to be time-saving, led to higher involvement of the designers and increased focus on usability.

Self-reports showed that designers often make assumptions, due to a lack of information. It appeared that software developers are usually more designing for themselves than for the actual end users. The clear information in the design brief, in combination with the improved insight into the end user, seemed to help designers making fewer assumptions. This is supported by persona literature (Pruitt & Adlin, 2010), stating that personas tend to make designers more aware that they are not the same as the end users. This helps to prevent self-referential design (Miaskiewicz & Kozar, 2011). The persona provided the designers with more insight into the 'real' user, which appeared to make it easier to empathize. This is in line with research from Miaskiewicz and Kozar (2011), stating that personas increase the audience focus and lead to the creation of empathy.

Another finding of the current study was that the use of a persona with scenario appeared to help detecting design flaws at an earlier stage. The persona seemed to be time-saving, as the persona provided them with useful and clear information from the beginning. Although the persona Robert was a fictional character, he was referred to as a real user. The design brief appeared to increase the feeling of designing for an actual user, leading to increased involvement of the designers. This benefit is comparable to more engagement and unification, which is supported by persona literature (Miaskiewicz & Kozar, 2011)

Although the designers mentioned to have used the design brief frequently, the observations showed the opposite. The observers indicated that the persona and scenario were used rarely to very rarely. While the observers were not present all the time, it could be that they did not obtain an adequate view of the use of the design brief. The use of the design brief seemed to be difficult to assess. On the other hand, it could be that social desirable answers were given in the self-reports. Despite the positive attitude of the designers, it can therefore not be stated with certainty how often the design briefs were used.

The second research question of sub study B was: *To what extent do the pictorial design brief and the text-based design brief lead to different prototypes and how can these differences be explained?* When comparing the different design processes and prototypes, it appeared that on the one hand there were indications in favour of the pictorial brief, such as actual use of the design brief, preference of the designers and remembered requirements. On the other hand, there were no conclusive differences between the actual prototypes.

Self-reports showed that the textual brief was mainly used at the start, while the pictorial brief was used throughout the project. This was in line with the observations. The designers with the pictorial brief were somewhat more focussed on Robert. Furthermore, designers with the pictorial brief referred to Robert as if he was a real person and seemed to have developed a parasocial relation with the persona Robert, which in parasocial interaction literature is described as a one-way relationship with a fictional character (Horton & Wohl, 1956). Parasocial relationships can evoke emotional involvement (Tan, 1996) and identification with the character (Oatley, 2002), supporting the findings from the self-reports.

Self-reports showed that the designers preferred the pictorial brief over the textual brief. This finding was supported by the recall test, suggesting that the pictorial design brief led to better recall of requirements, which is in line with dual-coding theory (Paivio, 1971). This included both a greater number and a greater variety of requirements. However, the total score of correctly remembered requirements was relatively low in both teams, which can be explained by the fact that is was unaided recall. The pictorial brief seemed to stimulate designers to remember the user needs and wishes throughout the process and made it easier to recall the images of the problems Robert encountered. This finding is supported by the multimedia principle of Mayer, stating that 'people learn better from words and pictures than from words alone'. (Mayer, 2014, p. 8). Mayer (2014) states that offering visual content in addition to textual content can have a positive impact on learning and remembering.

Although several findings are in favour of the pictorial design brief, the prototypes did not show clear differences on the inclusion of persona-related features. With regard to the usability, both teams had the same total usability score. However, one interesting difference was that the team with the pictorial brief clearly scored higher on the heuristic 'simple and natural dialogue'. This heuristic includes that a system should not include information that is irrelevant or rarely needed. This could possibly be related to the visual presentation of the scenario, while the team with the pictorial brief indicated that it was easier to recall relevant information about the persona's needs. In addition, observations showed that the designers with the pictorial brief were somewhat more focussed on Robert during the project. The

current study was a N=2 study. Therefore, not finding a final outcome of the different design briefs may also be the result of the initial quality of the teams, which was not controlled for.

While the prototypes did not show conclusive differences, it should be considered that the positive self-reports could be influenced by beliefs. Serra & Dunlosky (2010) found that students rated themselves as learning better from texts that included visuals than text alone, even though it did not improve their actual performance. Therefore, these beliefs might have influenced the judgements about the design brief.

The prototype and process of the designers using the textual brief were assessed as somewhat better than designers using the pictorial brief. However, it was difficult to assess the prototypes at this early stage because they were not finished. Besides, the designers faced some technical problems during the project. Beforehand, it was expected that the resource code could be copied from the existing Breindebaas app. However, during the project it was discovered that the resource code had to be reprogrammed, because it was too old. Due to the technical challenges, the motivational elements that would make the prototypes stand out more from each other, were not included yet. According to the observers, the somewhat better performance of the team with the textual brief could be attributed to more design experience and the fact that they have worked together more often in the past.

By using a design brief including a persona and use-case scenario, the current study can be perceived as having a narrative approach. Kreuter et al. (2007) defined a narrative as "a representation of connected events and characters that has an identifiable structure, is bounded in space and time, and contains implicit or explicit messages about the topic being addressed" (p. 222). Narrative and non-narrative communication can capture the same message. However, non-narrative communication is more explanatory and didactic, including reasons and arguments, while narrative communication usually includes a series of connected events, characters and consequences (Kreuter et al., 2007). Therefore, narrative communication is applicable to the design brief, with in particular the use-case scenario, that was used in the current study. Kreuter et al. (2007) named several advantages of narrative communication, such as improved ease of processing, emotional and cognitive involvement, and identification with the character. Besides, narrative communication seems to improve credibility, realism and veracity (Kreuter et al., 2007). These capture generally the same aspects as in the current study, which indicates that the benefits of narrative theory seem to be applicable to the use of persona-based use-case scenarios as well.

In line with narrative theory, the persona-based design brief appeared to make the design instruction more realistic, vivid and credible. It appears that using this story-telling

format enhances feelings of designing for the actual user, which seems to make it easier to empathise with the end users and increases involvement of the designers. These findings are supported by narrative theory, suggesting that using a story-telling format makes information easier to remember, relate to and more convincing (Abott, 2008).

Overall, using a persona-based design brief in a narrative format seems to be highly beneficial in design. According to Kreuter et al. (2007), narrative communication is effective because it includes a basic mode of human interaction. It is a familiar way of sharing information, because people learn and communicate mainly through stories. This might possibly explain the positive experience of using a design brief, as stated in the self-reports by the designers. Since both design brief formats were of a narrative style, this cannot explain the different performances of the teams. Possibly, the pictorial design brief could be experienced as somewhat more narrative than the text-based version, in which the addition of pictures could have contributed to a more vivid presentation of the end user and his needs.

Limitations

With regard to the current study, several limitations can be named. The first limitation of the current study is the small sample size of the teams (n=2), contributing to low internal validity (Campbell, 1986). By comparing only two groups, it is difficult to draw conclusions from the current study. There was no control group included. Therefore, it is not known what would have happened when one team did not receive a persona-based design brief. However, in the current situation it was not possible to include more groups, as it was a study project in which only two groups enrolled to this project.

The second limitation of the current study is that there was not controlled for the initial quality of the design teams. One of the teams had previously collaborated before and had more design experience in comparison to the other team. This means the level of the students was probably not the same at baseline, which could have influenced the results. While the more experienced students received the text-based design brief, that was expected to be less effective in enhancing user-centered thinking, it is possible that their design experience compensated for the 'less effective' brief, leading to a similar prototype as the less experienced students with the 'more effective' pictorial brief. Therefore, it could be that the impact of the design brief was influenced by amount of design experience. Similar design experience at baseline could have possibly led to a favour of the pictorial design brief.

The third limitation is that the external validity of the current study can be perceived as relatively low (Calder, Phillips, & Tybout, 1982). The designers in this study were students,

who have in general less experience than professionals, and were advised and supervised by a coach during the project. Experienced designers possibly adopt a more autonomous approach with less assistance. When the design brief would be provided to experienced designers, there would probably be less external influences. Furthermore, it is possible that professionals have more knowledge about user-centered design, in contrast to the students in this study, who were not familiar with this concept. Thus, it is not clear if the findings of the current study are generalizable to professional app designers. However, with regard to the persona and scenario, the findings of the current study are in line with benefits named in persona literature (Miaskiewicz & Kozar, 2011). Therefore, it can be stated that, for the aim of the current study, Software Engineering students could be comparable with professional app designers. With regard to the different presentation formats, it is expected that it is slightly easier for professional app designers to work with a text-based scenario, compared to students. While professionals have generally more design experience, including detecting design flaws and user problems, it might be easier for them to visualize user problems without having to use a pictorial design brief. However, for people in general it is easier to recall images than text. This was already stated by Paivio (1971) and Mayer (2014) and confirmed by the current study. Therefore, it is expected that the pictorial design brief would lead to the most user-centered design, in both student designers and professional designers.

The fourth limitation is that the designers in the current study received an existing app that they had to rebuild. They could copy several elements from the existing app and the overall concept and look of the app was already provided. It is plausible that building an app from scratch requires more input and creativity. This would demand more use of the persona and design brief. Hence, it is possible that this would lead to a greater benefit of the persona that would be more visible in the prototypes and to more considerable differences between the different presenation formats. Therefore, it should be taken into account that the influence of the persona-based design brief could have been different when building an app from scratch.

The fifth limitation of the current study was that the usability assessment seemed to be not suitable. While the prototypes were not finished, it was not possible to accurately assess the usability. The assessment was only based on the presentations of the prototype, which means that the prototypes were not actually used by the assessors. The assessors described the heuristics as vague and unclear. Three heuristics were deleted from the analysis because they were not applicable. Furthermore, it was not clear to the assessors who was the ‘user’. Some of them assessed from the perspective of themselves as professional users, focusing on the research related features such as the backend and retrieving data from the system. Others

assessed from the perspective of the end users. These problems might be related to the fact that the usability assessors in the current study were no usability experts. According to Nielsen (1992), usability specialists are more successful in conducting a heuristic evaluation than those without usability expertise. In the current study, assessing the unfinished prototypes with this approach did not seem to provide very valuable information.

The sixth limitation is that, due to time limitations, the evaluation of the final prototypes was not included into the current study. In this first phase, the students focused mainly on the technical aspects of the app, which seems to have distract them from the creative process. The evaluated prototypes did not include persuasive (game) elements yet, such as performance feedback and reinforcement. Therefore, it was difficult to assess at this stage in which way the design brief influenced their prototype.

Strengths

One of the strengths of the current study was the mixed methods approach, in which the qualitative and quantitative data complemented each other. Multiple data sources were used, including self-reports, repeated observations, usability test and a recall test. In this way, attempts were made to obtain an adequate view of the influence of the persona and the different scenarios on the prototypes and design process. The second strength is that longitudinal data were obtained during the current study, by following the designers for five consecutive weeks. The current study can be perceived as having a single-case design, in which participants served as their own control. Advantage of this method is that participants were followed closely, which provided the possibility for more in depth research (Kratochwill et al., 2010). The third strength of the current study is that a persona was developed and applied in an actual design project. Therefore, this study can be perceived as a field experiment, as it was a practical and real-life design project, leading to results that are close to non-experimental settings. While empirical literature on this topic is very sparse, this innovative study serves as a valuable addition. The last strength is that the current study adds knowledge on how to brief a persona-based use-case scenario to designers. This knowledge can be used for briefing future software developers.

Recommendations

On the basis of the current study, several recommendations can be made. First, it is recommended to evaluate the final prototypes again at the end of the project. It is expected that at the end stage of the project, when creative and motivational elements are included, the

prototypes will probably stand out more from each other. By evaluating the final prototypes, the influence of the design brief can probably be examined more accurately.

Second, it is recommended to perform a similar study with a larger sample including a control group. This will probably increase the validity, which will make it easier to make statements about the effectiveness of the design brief. On the basis of the preliminary results, it is recommended to use the pictorial presentation format. It should be further examined whether pictorial content actually leads to more user-centered design than textual content.

Lastly, it is recommended to use a persona-based design brief in the development of eHealth software. In concordance with the literature, the current study showed several advantages of using personas, such as the enhancement of user-centered thinking.

Despite the fact that the use of personas in user-centered design is an upcoming topic, there is not much literature yet about the creation of personas and the use of a design brief. The current study provided more insight into the methodology of creating personas, on the basis of a needs assessment. Furthermore, the differences between pictorial and textual design briefs were explored. These preliminary results can be used for further research.

Conclusion

The current study had both a practical and a methodological aim. The practical aim of the current study was to design a persuasive prototype of a CBM app that is suitable for its users and accepted by professionals. The phases of the CeHRes Roadmap were followed to support the participatory development process of this new eHealth technology. By involving stakeholders early in the design process, subgroup specific information was used to formulate user requirements. The methodological aim of this study was to study the impact of persona-based design briefs on the design process and prototypes and how to present this briefing in the most effective format. The current study suggests that persona-based design briefs have a positive impact on the design. Several advantages of personas were shown, such as the enhancement of user-centered thinking. With regard to the presentation of the design briefs, there are careful indications that a pictorial format is more effective than a text-based format. Both design briefs can be perceived as having a narrative style, which might be an explanation for the positive findings of the current study. Possibly, the narrative style was enhanced by the increased vividness of the pictorial design brief. The current study provided detailed insight into the process of developing a persona. Furthermore, it applied the use of this persona in a practical, real-life design project, of which promising results were shown. More empirical research with regard to personas in user-centered design is highly needed.

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Appendix A
Interview schedule potential users

Introductie
- Welkom, voorstellen van de gespreksleider (en assistent)
- **Doel van dit onderzoek:** Breindebaas is een app waarmee u met een swipe-training uw alcoholgebruik kunt verminderen. Momenteel wordt de app verbeterd en hiervoor hebben we input nodig van mensen die een dergelijke app in de toekomst mogelijk zouden willen gebruiken. We vinden het belangrijk dat u hierin uw mening kunt geven, zodat wij de app nog beter kunnen aanpassen aan de voorkeuren van gebruikers.
- **Duur:** ongeveer 30 minuten
- **Structuur:** In dit gesprek zal ik u een aantal vragen stellen over de Breindebaas app. Als het goed is hebt u de app van tevoren al een keer uitgetest (zo niet: dan laat ik u de app zo eerst even uitproberen). Ik ben vooral benieuwd naar uw ideeën, meningen en persoonlijke ervaringen. Er zijn geen goede of foute antwoorden, het gaat erom wat u vindt en waarom u dat vindt.
- Er zal een **audio opname** worden gemaakt en er wordt (anoniem) verslag gemaakt van dit interview. Uw gegevens zullen alleen gebruikt worden voor dit onderzoek.
- Hebt u nog vragen voor we beginnen?

Algemene vragen
- Wat is uw leeftijd?
- Kunt u kort aangeven wat u in het dagelijks leven doet? (werk of studie)

Introductie vraag
Voordat we beginnen over de app, eerst een algemene vraag:
- Heeft u wel eens smartphone apps gebruikt die betrekking hebben op de gezondheid?
- Wat vindt u van deze apps?

Doel van de training
Voordat de echte training in de app begint, wordt er een kort filmpje met uitleg getoond.
Hebt u dit filmpje met uitleg bekeken?
Indien nee: Breindebaas app laten zien op telefoon, laat geïnterviewde het filmpje met de uitleg zien.
Indien ja:
- Wat vindt u van de uitleg van de training in de app?
  - Is het duidelijk wat u moet doen? (praktische uitvoering)
  - Is het duidelijk wat het nut is van de training? (relevantie)
- Hebt u verbeterpunten met betrekking tot de uitleg van de training?

Mening over huidige app
Als het goed is hebt u de app van tevoren al even uitgeprobeerd.
- Wat vond u van deze trainingssessie? Hoe heeft u dit ervaren?
- Wat vindt u positieve/negatieve punten van de app?
- Zou u deze app zelf willen gebruiken om uw alcoholconsumptie te verminderen? Waarom wel/niet?

Lengte van de training
- Wat vindt u van de lengte van de training? *(aantal plaatjes; momenteel 100 per sessie)*
- In welke mate denkt u dat het aantal plaatjes dat u moet swipen in één training sessie invloed heeft op uw motivatie?

Even terugkomend op het filmpje vóór de training, waarin werd genoemd dat je regelmatig moet oefenen en ook om hoeveel plaatjes het gaat:

- In hoeverre bent u van mening dat het herhaaldelijk trainen (en de hoeveelheid plaatjes) helder is toegelicht vóór dat u begon met trainen?
- Heeft u voor aanvang van de training informatie gelezen over de app? (buiten de app om, dus bijv. op het internet)
  - Zo ja, welke informatie? Wat vond u hiervan?

In de app store, waar u de app kunt downloaden, staat ook informatie over de training vermeld.

- Heeft u de bijbehorende informatie in de app store gelezen?
  Zo ja: Wat vindt u van deze informatie?
  Zo nee: informatie tonen en laten lezen en vervolgens: Wat vindt u van deze informatie?
- Hebt u ideeën voor hoe we de toelichting en uitleg van de training zouden kunnen verbeteren?

Inhoud van de training

- Wat vindt u van de plaatjes in de training? Wat was het effect van de plaatjes op u?
- Wat zou u ervan vinden als u zelf plaatjes van drankjes kon selecteren?
  - Wat zou hierbij belangrijk zijn voor u?
  (bijv. type drankje voldoende? Of merk ook belangrijk? Of grootte van het glas?)

Motivatie in de app

Zoals u net heeft kunnen zien bestaat de trainingssessie uit veel herhaling.

- Zou u gemotiveerd zijn om een training sessie in deze app te voltooien?
  Waarom wel/niet?
- Zou u gemotiveerd zijn om 2x per week een training sessie in de app te voltooien?
  Waarom wel/niet?
- Wat zou ervoor zorgen dat u meer gemotiveerd raakt om te trainen in de app (en te blijven trainen)?

** Indien geen interesse in gebruik app: Zou u zich voor kunnen stellen dat iemand anders gemotiveerd is om een training sessie/ 2x per week een training te voltooien?*

Gamification

We hebben eerder mensen gevraagd wat ze van de app vinden. Daar kwam uit dat er misschien game elementen of ander motiverende elementen kunnen worden toegevoegd aan de app.

- Wat zou u er van vinden als er game-elementen aan de training worden toegevoegd?
- Welke elementen zou u graag willen zien in de Breindebaas app?
  Welk type game/spelletjes vindt u passen bij de app?
  (zie voorbeelden op volgende bladzijde)

Indien geïnterviewde hier niet zelf op komt, mening vragen over volgende elementen.
Hierbij kunnen de geprinte voorbeelden van apps getoond worden ter verduidelijking.

1. **Doel-stellen in de app**
   Waarover zou dit doel volgens u moeten gaan? Bijvoorbeeld:
   - Aantal glazen alcohol
   - Aantal trainingen (in totaal of per week)
2. **Feedback over uw performance**
   Wat zou u het liefst willen weten over uw performance? (waarover feedback) Bijvoorbeeld:
   - Snelheid: Hoe snel reageert u?
   - Nauwkeurigheid: Hoeveel fouten heeft u?
   - Vooruitgang: Bent u nu beter dan de vorige keer?
   - Alcoholgebruik: Aantal glazen dat u minder drinkt
   - Bias: Is de bias verminderd?
     → *Uitleg bias: het kost tijd om plaatjes weg te swipen of naar je toe te halen (reactietijd). Als het je meer tijd kost alcohol weg te swipen, dan heb je een bias. Dat kun je uitdrukken in een getal.*
   - Progress: overzicht van al voltooide trainingen en hoeveel nog te gaan (progress bar)
3. **Challenge**
   Uitdagingen die u voor uzelf aangaat, bijvoorbeeld:
   - Dit weekend helemaal niet drinken en 2x trainen.
   - Deze week elke dag trainen.
   - High score op training halen.
4. **Verhaallijn**
   Denk aan een figuurlijke weergave van iets dat aan het veranderen is, bijvoorbeeld een poppetje (hersentje) dat steeds gespierder wordt.
5. **Motivational agents**
   Soort coach, virtueel, die u door de training heen begeleidt, aanmoedigt, tips en feedback geeft etc.

Kernvraag
Na alles wat u zojuist gehoord heeft:

- Op welke manier kunnen we, volgens u, de motivatie om te (blijven) trainen in de Breindebaas app verhogen?
- Hoe zou de verbeterde app er volgens u uit moeten zien?
  - Welke elementen moeten er wel in en welke juist niet?

Afsluiting

- Bedankt voor uw deelname aan dit interview
- Hebt u verder nog vragen?
- Over enkele maanden zouden we het fijn vinden u nog een keer om uw mening te vragen aan de hand van de nieuwe ontwerpen. Vindt u dat goed?

Appendix B

Interview schedule professionals

Introductie

- Welkom, voorstellen van de gespreksleider (en assistent)
- **Doel van dit onderzoek:** Breindebaas is een app waarmee mensen met een swipe-training hun alcoholgebruik kunnen verminderen. Momenteel wordt de app verbeterd zodat wij de app nog beter kunnen aanpassen aan de voorkeuren van gebruikers. Naast de mening van gebruikers vinden we het ook belangrijk dat professionals hun mening kunnen geven over de herontwikkeling van de app. Wij willen graag weten wat de app volgens u meer geloofwaardig en betrouwbaar maakt en of u deze app zou aanraden aan cliënten.
- **Duur:** ongeveer 30 minuten
- **Structuur:** In dit gesprek zal ik u een aantal vragen stellen over de Breindebaas app. Als het goed is hebt u de app van tevoren al een keer uitgetest (zo niet: dan laat ik u de app zo eerst even uitproberen). Ik ben vooral benieuwd naar uw ideeën, meningen en persoonlijke ervaringen. Er zijn geen goede of foute antwoorden, het gaat erom wat u vindt en waarom u dat vindt.
- Er zal een **audio opname** worden gemaakt en er wordt (anoniem) verslag gemaakt van dit interview. Uw gegevens zullen alleen gebruikt worden voor dit onderzoek.
- Hebt u nog vragen voor we beginnen?

Algemene vragen

- Wat is uw leeftijd?
- Kunt u kort aangeven wat u in het dagelijks leven doet? (werk of studie)

Introductie vraag

Voordat we beginnen over de app, eerst een algemene vraag:

- Heeft u wel eens smartphone apps gebruikt die betrekking hebben op de gezondheid?
- Wat vindt u van deze apps?

Doel van de training

Voordat de echte training in de app begint, wordt er een kort filmpje met uitleg getoond.
Heeft u dit filmpje met uitleg bekeken?
Indien nee: Breindebaas app laten zien op telefoon, laat geïnterviewde het filmpje met de uitleg zien.
Indien ja:

- Wat vindt u van de uitleg van de training in de app?
  - Is het duidelijk voor gebruikers wat zij moeten doen? (praktische uitvoering)
  - Is het duidelijk voor gebruikers wat het nut is van de training? (relevantie)
- Hebt u verbeterpunten met betrekking tot de uitleg van de training?

Mening over huidige app

Als het goed is hebt u de app van tevoren al even uitgeprobeerd.

- Wat vond u van deze trainingssessie? Hoe hebt u dit ervaren?
- Wat vindt u positieve punten van de app?
- Wat vindt u negatieve punten van de app?

Lengte van de training

- Wat vindt u van de lengte van de training? (aantal plaatjes; momenteel 100 per sessie)
- In welke mate denkt u dat het aantal plaatjes dat een deelnemer moet swipen in één training sessie invloed heeft op de motivatie?

Even terugkomend op het filmpje vóór de training, waarin werd genoemd dat iemand regelmatig moet oefenen en ook om hoeveel plaatjes het gaat:

- In hoeverre bent u van mening dat het herhaaldelijk trainen (en de hoeveelheid plaatjes) helder is toegelicht vóór aanvang van de training?
- Heeft u voor aanvang van de training informatie gelezen over de app? (buiten de app om, dus bijv. op het internet)
  - Zo ja, welke informatie? Wat vond u hiervan?

In de app store, waar u de app kunt downloaden, staat ook informatie over de training vermeld.

- Heeft u de bijbehorende informatie in de app store gelezen?
  Zo ja: Wat vindt u van deze informatie?
  Zo nee: informatie tonen en laten lezen en vervolgens: Wat vindt u van deze informatie?
- Hebt u ideeën voor hoe we de toelichting en uitleg van de training zouden kunnen verbeteren?

Inhoud van de training

- Wat vindt u van de plaatjes in de training? Wat zou het effect kunnen zijn op de deelnemers?
- Wat zou u ervan vinden als gebruikers zelf plaatjes van drankjes kunnen selecteren?
  - Wat zou hierbij volgens u van belang zijn?
  (bijv. type drankje voldoende? Of merk ook belangrijk? Of grootte van het glas?)

Implementatie

- Zou u deze app aanraden aan cliënten om de alcoholconsumptie te verminderen?
  - Indien ja: Waarom zou u de app aanraden? Aan alle of bepaalde cliënten?
  - Indien nee: Wat zou u hierin tegenhouden? Welke aanpassingen zouden er volgens u gemaakt moeten worden zodat u de app wel zou aanraden aan cliënten?
- Wat zou de app volgens u betrouwbaarder en geloofwaardiger maken?
- In hoeverre denkt u dat uw cliënten gebruik zouden willen maken van deze app? Waarom wel/niet?

Motivatie in de app

Zoals u net heeft kunnen zien bestaat de trainingssessie uit veel herhaling.

- Denkt u dat uw cliënten gemotiveerd zijn om een training sessie in deze app te voltooien? Waarom wel/niet?
- Denkt u dat uw cliënten gemotiveerd zijn om 2x per week een training sessie in de app te voltooien? Waarom wel/niet?
- Wat zou er volgens u voor zorgen dat gebruikers meer gemotiveerd raken om te trainen in de app (en te blijven trainen)?

Gamification

We hebben eerder mensen gevraagd wat ze van de app vinden. Daar kwam uit dat er misschien game elementen of ander motiverende elementen kunnen worden toegevoegd aan de app.

- Wat zou u er van vinden als er game-elementen aan de training worden toegevoegd? Wat denkt u dat uw cliënten hiervan zullen vinden?
- In hoeverre denkt u dat deze toevoeging gebruikers meer zal motiveren om te trainen?
- Welke elementen zou u graag willen zien in de Breindebaas app?
  Welk type game/spelletjes vindt u passen bij de app?
  (zie voorbeelden op volgende bladzijde)

Indien geïnterviewde hier niet zelf op komt, mening vragen over volgende elementen.
Hierbij kunnen de geprinte voorbeelden van apps getoond worden ter verduidelijking.

1. **Doel-stellen in de app**
   - Waarover zou dit doel volgens u moeten gaan? Bijvoorbeeld:
     - Aantal glazen alcohol
     - Aantal trainingen (in totaal of per week)
2. **Feedback over performance**

- Waarover zou deze feedback volgens u moeten gaan? Bijvoorbeeld:
  - Snelheid: Hoe snel reageert de deelnemer?
  - Nauwkeurigheid: Hoeveel fouten heeft de deelnemer?
  - Vooruitgang: Is de deelnemer nu beter dan de vorige keer?
  - Alcoholgebruik: Aantal glazen dat de deelnemer minder drinkt
  - Bias: Is de bias van de deelnemer verminderd?

  → *Uitleg bias: het kost tijd om plaatjes weg te swipen of naar je toe te halen (reactietijd). Als het je meer tijd kost alcohol weg te swipen, dan heb je een bias. Dat kun je uitdrukken in een getal.*
  - Progress: overzicht van al voltooide trainingen en hoeveel nog te gaan (progress bar)

3. **Challenge**
   Uitdagingen die u voor uzelf aangaat, bijvoorbeeld:
   - Dit weekend helemaal niet drinken en 2x trainen.
   - Deze week elke dag trainen.
   - High score op training halen.
4. **Verhaallijn**
   Denk aan een figuurlijke weergave van iets dat aan het veranderen is, bijvoorbeeld een poppetje (hersentje) dat steeds gespierder wordt.
5. **Motivational agents**
   Soort coach, virtueel, die gebruikers door de training heen begeleidt, aanmoedigt, tips en feedback geeft etc.

Kernvraag

Na alles wat u zojuist gehoord heeft:

- Hoe zou de verbeterde app er volgens u uit moeten zien?
  - Welke elementen moeten er wel in en welke juist niet?
- Welke voor- en nadelen voorziet u, bij implementatie van de nieuwe app in de praktijk?
- Hoe zouden wij dit volgens u kunnen verbeteren?

Afsluiting

- Bedankt voor uw deelname aan dit interview
- Hebt u verder nog vragen?

Appendix C

Informed consent interviews

Titel onderzoek: Herontwikkeling van de Breindebaas app

Introductie

U bent uitgenodigd om deel te nemen aan een interview over de herontwikkeling van de Breindebaas app. Breindebaas is een app waarmee u met een swipe-training uw alcoholgebruik kunt verminderen. Momenteel wordt de app verbeterd en hiervoor hebben we input nodig van mensen die een dergelijke app in de toekomst mogelijk zouden willen gebruiken. We vinden het belangrijk dat u hierin uw mening kunt geven, zodat wij de app nog beter kunnen aanpassen aan de voorkeuren van gebruikers. In dit interview zullen u een aantal vragen gesteld worden over de Breindebaas app. Het gaat hierbij vooral om uw ideeën, meningen en persoonlijke ervaringen. Hierbij zijn er geen goede of foute antwoorden. Het interview zal worden opgenomen. De informatie zal alleen gebruikt worden voor het huidige onderzoek. We verzekeren u ervan dat de informatie geanonimiseerd zal worden. Uw privacy en anonimiteit zullen altijd gegarandeerd worden. U mag zelf bepalen welke informatie u wilt delen. U kunt op elk moment uw deelname aan het onderzoek beëindigen. Deelname aan dit onderzoek zal ongeveer 30-45 minuten duren.

<u>In te vullen door de deelnemer</u>

Ik verklaar op een voor mij duidelijke wijze te zijn ingelicht over de aard, methode, doel en de risico's en belasting van het onderzoek. Ik weet dat de gegevens en resultaten van het onderzoek alleen anoniem en vertrouwelijk aan derden bekend gemaakt zullen worden. Mijn vragen zijn naar tevredenheid beantwoord. Ik begrijp dat geluidsmateriaal of bewerking daarvan uitsluitend voor analyse en/of wetenschappelijke presentaties zal worden gebruikt. Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik behoud me daarbij het recht voor om op elk moment zonder opgaaf van redenen mijn deelname aan dit onderzoek te beëindigen. Als ik na afloop van het onderzoek nog vragen heb zal ik contact opnemen met de onderzoekers via e-mail.

Naam deelnemer: …… Handtekening: …….
Datum: ….……..

<u>In te vullen door de uitvoerende onderzoeker</u>

Ik heb een mondelinge en schriftelijke toelichting gegeven op het onderzoek. Ik zal resterende vragen over het onderzoek naar vermogen beantwoorden. De deelnemer zal van een eventuele voortijdige beëindiging van deelname aan dit onderzoek geen nadelige gevolgen ondervinden.

Naam onderzoeker: …… Handtekening onderzoeker:…….……..
Datum: ……

Appendix D

Codescheme interviews

Code level 1	Code level 2	Code level 3
Demografische gegevens	Leeftijd	
	Opleiding/werk	
Smartphone apps gezondheid		
Uitleg en toelichting training	Filmpje	Praktische uitvoering
		Relevantie (nut)
		Herhaaldelijk trainen
		Technische aspecten (e.g. kwaliteit)
	Informatie buiten app om	Appstore
		Overige
	Informatie in app	
	Verbeterpunten	
Mening Trainingssessie	Positief	
	Negatief	
	Zelf gebruiken	
Lengte trainingssessie	Mening	
	Invloed op motivatie	
Inhoud trainingssessie	Mening plaatjes	Positief
		Negatief
	Voorkeuren plaatjes	
	Zelfselectie plaatjes	
Motivatie in de app	Motivatie momenteel	
	Verhogen motivatie	
Toevoegen gamification	Mening	
	Elementen	Doel-stellen in app
		Performance feedback
		Challenge
		Verhaallijn
		Motivational agents
		Overige
Conclusie verbeterde app		

Appendix E

Persona Robert

ROBERT

"IK ZOEK EEN SIMPELE MANIER OM ZELF AAN MIJN ALCOHOLGEBRUIK TE WERKEN"

IN HET KORT

- 52 jaar oud
- Financieel medewerker
- Vrouw en 3 kinderen
- Wandelen, fietsen en tennis
- Houdt van varen
- Wil minderen met het gebruik van alcohol

OVER ROBERT

Algemeen

Robert is 52 jaar oud en werkt als financieel medewerker. Hij woont samen met zijn vrouw en hun 3 kinderen (17, 20 en 23 jaar oud). In zijn vrije tijd doet Robert graag leuke dingen samen met zijn familie. Zijn hobby's zijn wandelen, fietsen en tennis. Hij heeft zijn eigen boot en houdt ervan om samen met zijn gezin te gaan varen.

Alcohol gebruik

Robert houdt van gezelligheid. Voor hem hoort daar ook bij dat hij graag een wijntje drinkt. Hij merkt echter dat hij steeds vaker alcohol drinkt, momenteel zelfs zo'n 5-6 glazen per dag. Hij realiseert zich dat dit teveel is. Zijn vrouw laat hem regelmatig weten dat zij zich zorgen maakt over zijn alcohol gebruik. Robert heeft al eerder een poging ondernomen om iets te doen aan zijn gebruik. Een aantal maanden geleden wilde hij compleet stoppen met alcohol drinken, maar dit is hem niet gelukt. Het was toch een stuk lastiger dan hij had gedacht. Robert zoekt naar een manier om minder alcohol te gaan drinken, maar hulp zoeken van de huisarts gaat hem toch echt te ver…

Technologie

Robert heeft een positieve houding tegenover technologie. Hij heeft een smartphone en gebruikt deze dagelijks voor bellen en appen. Hij heeft voornamelijk functionele apps, zoals een app over het weer en een app waarmee hij zijn treinreis kan plannen. Op zijn smartphone staan niet veel apps, maar hij staat open voor nieuwe dingen. Tegenwoordig zijn er steeds meer apps en dit vindt Robert erg handig. Ze zijn eenvoudig en je hebt ze eigenlijk altijd bij de hand.

** Images are used for illustration purposes only, this is not an actual user of the app.*

Appendix F

Tekst-based scenario

ROBERT

"DE BREINDEBAAS APP MOET MIJ MOTIVEREN OM TE BLIJVEN TRAINEN"

SCENARIO: EEN TRAININGSSESSIE IN DE BREINDEBAAS APP

In de appstore komt Robert de app 'Breindebaas' tegen. Deze app trekt zijn aandacht, hij ziet er visueel aantrekkelijk uit met mooie kleuren. Het lijkt hem een simpele manier om zelf iets doen aan zijn alcoholgebruik. Robert download de app. Voordat hij kan beginnen met trainen moet hij zijn alcohol consumptie invullen van de afgelopen week. Hij vult dit in en als hij verder klikt staat er een filmpje met uitleg klaar. Hij start het filmpje en bekijkt hem. Nadat hij het filmpje heeft gekeken is het voor hem duidelijk wat hij moet doen: plaatjes van fris naar zich toe swipen en plaatjes van alcohol van zich af. Hij snapt alleen niet wat het doel is van het swipen. Het is voor hem niet duidelijk hoe deze training invloed heeft op het laten staan van alcohol. Hij zou daarom graag meer informatie willen over het nut en effect van de training.

Robert begint met zijn eerste training sessie. Hij vindt het simpel en best leuk om te doen. Hij vindt wel dat sommige plaatjes niet bij hem passen. Hij lust helemaal geen cola, maar dit moet hij toch naar zich toe swipen. Het zou volgens hem veel beter zijn als hij alleen zijn favoriete drankjes kon selecteren. Na een tijdje swipen begint het Robert te vervelen, zo'n training sessie duurt hem toch wel lang. Hij vindt de training maar saai. Het irriteert hem dat er veel tijd zit tussen de plaatjes, hij moet steeds lang wachten tot het volgende plaatje komt.

Na het swipen van honderd plaatjes is de sessie dan eindelijk klaar. Robert vindt het zo wel weer goed geweest. Hij krijgt een eindplaatje te zien met een snelheid, maar dit zegt hem niets. Hij zou het leuker vinden om een soort beloning te krijgen, gewoon iets simpels zoals een sterretje. Om zijn gedrag te kunnen veranderen moet Robert regelmatig trainen in de app. Hij vergeet dat soort dingen snel en moet hier echt aan herinnert worden. Hij zou het fijn vinden om een reminder te krijgen die hem vertelt dat er een nieuwe sessie klaar staat. Het lijkt hem overzichtelijk om te kunnen zien hoeveel sessies hij al voltooid heeft en hoeveel sessies hij nog moet doen. Robert zou het prettig vinden om regelmatig feedback en positieve bekrachtiging te krijgen.

** Images are used for illustration purposes only, this is not an actual user of the app.*

Appendix G

Pictorial scenario

ROBERT

"DE BREINDEBAAS APP MOET MIJ MOTIVEREN OM TE BLIJVEN TRAINEN"

SCENARIO: EEN TRAININGSSESSIE IN DE BREINDEBAAS APP

1. Robert heeft de Breindebaas app gedownload in de app store. Deze app lijkt hem ideaal om thuis zelf aan zijn alcoholgebruik te werken. Hij vindt dat de app er mooi en simpel uit ziet.

2. Voordat de training begint verschijnt er een filmpje met uitleg. Na dit filmpje is het voor Robert duidelijk wat hij moet doen, maar wat het nut en effect is van de training is voor hem niet duidelijk.

3. Robert begint met trainen. Het is simpel en best leuk. Hij vindt wel dat sommige plaatjes niet bij hem passen. Hij zou daarom liever zijn eigen plaatjes kiezen.

4. Het swipen begint Robert te vervelen. Het irriteert hem dat er telkens veel tijd zit tussen de plaatjes. Hierdoor duurt de sessie nog langer.

5. Robert is eindelijk klaar met de sessie. Het eindplaatje zegt hem niets. Hij heeft liever een simpele beloning na het afronden van een sessie, bijvoorbeeld een sterretje.

6. Robert zou het prettig vinden om regelmatig feedback en positieve bekrachtiging te krijgen. Hij zou ook meer inzicht willen in zijn voortgang.

** Images are used for illustration purposes only, this is not an actual user of the app.*

Appendix H

User goals and research goals

USER GOALS

Robert wil…

- dat de app er mooi uit ziet
- dat de app simpel en overzichtelijk is
- weten wat het nut en effect is van de training
- dat de app hem motiveert om te blijven trainen
- dat hij zijn eigen plaatjes kan kiezen
- dat hij regelmatig feedback en positieve bekrachtiging krijgt
- dat er zo min mogelijk tijd zit tussen de plaatjes
- dat hij inzicht heeft in zijn voortgang van zowel het trainen als het alcoholgebruik

RESEARCH GOALS

- Ruimte voor een filmpje (voor aanvang van de training), dat eenvoudig op een later moment toegevoegd kan worden.
- Een informatie pagina, die verschijnt bij het openen van de app, met de volgende aspecten:
  - Link naar de website www.tactus.nl/breindebaas voor uitleg over effect en nut van de training
  - Instructie om filmpje te bekijken
  - Disclaimer (risico's: plaatjes kunnen wellicht een trigger zijn)
  - Privacy
- Een bias-meting vóór de eerste sessie en na een X aantal sessies
- Een database waarin gebruikers zelf plaatjes kunnen selecteren van drankjes (min. X en max. Y)
- De mogelijkheid voor de onderzoekers om de database zelf te vullen met plaatjes
- Een optie menu waarin deelnemers een aantal features in- en uit kunnen schakelen:
  - Reminders (ja/nee, hoe vaak, toestaan zonder WIFI verbinding)
  - Plaatjes kunnen veranderen
  - Geluidjes aan/uit zetten en kiezen
  - Lettergrootte aanpassen
- Voor elke trainingssessie wordt de alcoholconsumptie van de afgelopen dagen gevraagd
- Er is een back-end (achterkant) waar de onderzoekers bij kunnen voor data extractie

Appendix I

Informed consent focus groups

Titel onderzoek: Herontwikkeling van de Breindebaas app

Introductie

De afgelopen weken zijn jullie bezig geweest met het ontwerpen van een nieuwe versie van de Breindebaas app. In het aankomende gesprek zal ik jullie een aantal vragen stellen over het tot stand komen van het prototype dat jullie hebben ontworpen. Daarnaast ben ik benieuwd welke rol de persona en het scenario hebben gespeeld in het ontwerpproces. Het gaat hierbij vooral om jullie persoonlijke ervaringen. Hierbij zijn er geen goede of foute antwoorden. Het interview zal worden opgenomen. De informatie zal alleen gebruikt worden voor het huidige onderzoek. We verzekeren u ervan dat de informatie geanonimiseerd zal worden. Uw privacy en anonimiteit zullen altijd gegarandeerd worden. U mag zelf bepalen welke informatie u wilt delen. U kunt op elk moment uw deelname aan het onderzoek beëindigen. Deelname aan dit onderzoek zal ongeveer 15-30 minuten duren.

<u>In te vullen door de deelnemer</u>

Ik verklaar op een voor mij duidelijke wijze te zijn ingelicht over de aard, methode, doel en de risico's en belasting van het onderzoek. Ik weet dat de gegevens en resultaten van het onderzoek alleen anoniem en vertrouwelijk aan derden bekend gemaakt zullen worden. Mijn vragen zijn naar tevredenheid beantwoord. Ik begrijp dat geluidsmateriaal of bewerking daarvan uitsluitend voor analyse en/of wetenschappelijke presentaties zal worden gebruikt. Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik behoud me daarbij het recht voor om op elk moment zonder opgaaf van redenen mijn deelname aan dit onderzoek te beëindigen. Als ik na afloop van het onderzoek nog vragen heb zal ik contact opnemen met de onderzoekers via e-mail.

Naam deelnemer: …… Handtekening: …….
Datum: ….……..

<u>In te vullen door de uitvoerende onderzoeker</u>

Ik heb een mondelinge en schriftelijke toelichting gegeven op het onderzoek. Ik zal resterende vragen over het onderzoek naar vermogen beantwoorden. De deelnemer zal van een eventuele voortijdige beëindiging van deelname aan dit onderzoek geen nadelige gevolgen ondervinden.

Naam onderzoeker: …… Handtekening onderzoeker:……..……..
Datum: ……

Appendix J

Questions focus groups

Algemeen

- Hoe zijn jullie tot dit prototype gekomen?
  - Korte beschrijving: *Hoe is het tot stand gekomen? Welke stappen genomen?*

- Welke uitdagingen zijn jullie tegengekomen tijdens het ontwerpproces en hoe hebben jullie deze opgelost?

Persona & Scenario

- Wat vonden jullie ervan om te werken met een persona?
  - *Was het nuttig? Waarom wel of niet?*

- Welke rol heeft de persona gespeeld in het ontwerpproces?
  - *Welke positieve invloed had het? Of welke negatieve invloed?*
  - *Vergelijking met ontwerpen zonder persona*
  - *Voorbeeld noemen van een moment waarop de persona invloed heeft gehad*

- Welke rol heeft het scenario gespeeld in het ontwerpproces? (in hoeverre gebruikt)
  - *Positieve of negatieve invloed*
  - *Heeft het iets toegevoegd aan de persona? (waardevol, waarom wel of niet)*
  - *Voorbeeld noemen van moment waarop scenario invloed heeft gehad*
  - *in hoeverre geholpen bij het visualiseren van gebruikersbehoeften/wensen?*

- In hoeverre heeft de design brief jullie oplossing/prototype beïnvloed?
  - *Op welke manier heeft het jullie geholpen? Hoe ging dit?*
  - *Kunnen jullie een concreet voorbeeld hiervan noemen?*

- In hoeverre heeft de design brief invloed gehad op samenwerken en maken van beslissingen?
  - *Op welke manier?*
  - *Kunnen jullie een concreet voorbeeld noemen?*

- Hebben jullie informatie gedeeld met het andere team (software engineering)?
  - *zo ja, op welke manier? En welke informatie?*

- Zouden jullie een soortgelijke design brief opnieuw willen gebruiken in toekomstige ontwerpprojecten? Waarom wel/niet?

Appendix K

Questions persona recall test

Welke persoonlijke gegevens herinner je je nog van de persona?
(denk bijv. aan naam, leeftijd, hobby's en familie)

Wat herinner je je nog over het alcohol gebruik van de persona?

Wat herinner je je nog over de houding van de persona ten opzichte van technologie?

Welke wensen en behoeftes van de gebruiker herinner je je nog?

Appendix L

Usability heuristics scoring form

Scoring:
0 punten: het prototype bevat geen elementen die deze heuristic ondersteunen
1 punt: het prototype bevat één element dat deze heuristic ondersteund
2 punten: het prototype bevat twee of meer elementen die deze heuristic ondersteunen

	Heuristic	Score
1.	**Visibility of system status**: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time	
2.	**Match between system and the real world** The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.	
3.	**User control and freedom** Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support 'undo' and 'redo'. Home and back controls should be also present.	
4.	**Consistency and standards** Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions. Icons should be recognisable and consistent.	
5.	**Error prevention** Even better than good error messages is a careful design, which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.	
6.	**Recognition rather than recall** Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.	
7.	**Flexibility and efficiency of use** Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.	
8.	**Aesthetic and minimalist design** Dialogues should not contain information, which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.	
9.	**Help users recognize, diagnose, and recover from errors** Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.	
10.	**Help and documentation** Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.	

Appendix M

Observation checklist weekly

Team 1

1. Hebt u de afgelopen week contact gehad met team 1?
   - Ja (door naar volgende vragen)
   - Nee (door naar vragen team 2)
2. Hoe vaak hebt u in de afgelopen week contact gehad met team 1?
   [aantal invullen]
3. Op welke manier heeft dit contact plaatsgevonden?
   - mondeling
   - mail
   - anders, namelijk…

   (ook optie om beide aan te vinken)
4. Wat werd er in dit contact besproken?
5. Hebt u de groep (sturende) feedback of advies gegeven? Zo ja, kunt u dit beschrijven?
6. Zijn er u verder nog dingen opgevallen in het contact met het team of zijn er overige observaties die u wilt rapporteren?

Team 2

1. Hebt u de afgelopen week contact gehad met team 2?
   - Ja (door naar volgende vragen)
   - Nee (einde vragenlijst)
2. Hoe vaak hebt u in de afgelopen week contact gehad met team 2?
   [aantal invullen]
3. Op welke manier heeft dit contact plaatsgevonden?
   - mondeling
   - mail
   - anders, namelijk…

   (ook optie om beide aan te vinken)
4. Wat werd er in dit contact besproken?
5. Hebt u de groep (sturende) feedback of advies gegeven? Zo ja, kunt u dit beschrijven?
6. Zijn er u verder nog dingen opgevallen in het contact met het team of overige observaties die u wilt rapporteren?

Appendix N

Observation checklist specific

1. Hoe beschrijft u de interactie tussen uzelf en de teamleden van team 1, met betrekking tot het Breindebaas project van de afgelopen weken?

2. Op welke vlakken hebt u het team aangestuurd tijdens het ontwerpproces?
optie om meerdere aan te vinken
- Technische aspecten
- Vormgeving aspecten
- Gebruik van instructie (persona en scenario)
- Planning
- Anders, namelijk…

3a. In welke mate werd de persona 'Robert' volgens u door het team gebruikt in het ontwerpproces? (zeer weinig, weinig, gemiddeld, vaak, zeer vaak)
3b. In welke mate werd het scenario volgens u door het team gebruikt in het ontwerpproces? (zeer weinig, weinig, gemiddeld, vaak, zeer vaak)

Proces
4a. Hoe omschrijft u het proces en de samenwerking tussen de teamleden van team 1?
4b. In hoeverre denkt u dat de persona 'Robert' en het scenario invloed hebben gehad op het proces? (samenwerken, maken van beslissingen etc.)
4c. Geef een cijfer voor het proces en de samenwerking van team 1 (cijfer van 1 t/m 10)

Product
5a. Noem een aantal positieve en negatieve punten van het aangeleverde prototype
5b. In hoeverre denkt u dat de persona 'Robert' en het scenario invloed hebben gehad op het product? (voldoet het prototype aan gebruikerswensen)
5c. Geef een cijfer voor het aangeleverde prototype van team 1 (cijfer van 1 t/m 10)

6. Hebt u het team tijdens het proces gestimuleerd meer gebruik te maken van de gegeven instructie (persona en scenario)?
- *Bij antwoord ja: hoe vaak en op welke manier?*
- *Bij antwoord nee: door naar volgende vraag*

7. Zijn er u verder nog dingen opgevallen in het contact met het team of overige observaties die u wilt rapporteren?

Deze vragen worden herhaald voor team 2. Daarna volgen er nog een aantal vergelijkende vragen:

8. In hoeverre denkt u dat het verschil in scenario's invloed heeft gehad op het visualiseren van gebruikersproblemen?

9. Welke verschillen zijn er volgens u tussen de twee teams als u kijkt naar het functioneren?
10. Welke verschillen zijn er volgens u tussen de twee teams als u kijkt naar de aangeleverde prototypes?

Appendix O

Code scheme focus groups

Theme	Sub themes	Definition
Challenges		Describes the challenges that were faced by the teams during the design process and how these challenges were solved
Persona	Insight into user needs	Expressions related to increased insight into user needs and greater empathizing with the user
	Usability	Expressions related to increased usability of the prototype by using the persona
	Less assumptions	Expressions related to making less assumptions by using the persona
	Detecting problems at an early stage	Expressions related to detecting problems at an early stage in the design process by using the persona
	Time-saving	Expressions related to saving time by using the persona
	Involvement	Expressions related to increased motivation and involvement by using the persona
Scenario		Focuses on the role of the scenario in the design process and the influence on the prototype
Process & functioning		Outlines the influence of the design brief on the functioning within the teams, including collaboration and decision making
Future use design brief		Describes the opinion of the teams about using the design brief in the future
Motivational elements		Describes which motivational elements the teams are planning to use in their prototype

Appendix P

Scoring form persona recall test

Category	Sub category
Demographics	Name
	Age
	Wife
	Kids
	Hobbies
Alcohol consumption	Type of alcohol
	Number of glasses
	Desire to reduce alcohol consumption
Attitude towards technology	Positive attitude
Requirements	Visual attractive
	Simple and clear design
	Aim and effect
	Motivates to train
	Select own pictures
	Performance feedback
	Positive reinforcement
	Time interval between pictures
	Insight into progress
	Reminders

Appendix Q

Code scheme observations

Theme	Definition
Weekly observations	Outlines the observations per week, such as frequency of contact and content of interaction
Interaction in general	Describes the interaction between the observers and the students during the project
Areas of support	Describes in which areas the team was supported during the project (e.g. technical, planning, design).
Use of persona and scenario	Outlines the (frequency of) use of the persona and scenario during the project
Process & collaboration	Outlines the functioning of the group (e.g. collaboration, decision making and independency)
Influence of design brief on process	Influence of the persona and scenario on the functioning of the group
Prototypes	Describes the positive and negative points of the prototypes
Influence of design brief on prototypes	Outlines the influence of the persona and scenario on the prototypes
Stimulating use design brief	Describes to which extent the observers have stimulated the students to use the design brief
Other observations	Describes all other observations that were reported