Bachelor Thesis

Designing an eHealth approach for students with stress related problems, based on the goal management oriented intervention "Right on target"

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Abstract

A Dutch study with 551 student respondents, showed that 62% of them experienced constant stress. This stress can ultimately not only lead to a drop out of college, but also to serious mental and physical health issues. The most influencing self-management behavior to deal with stress, was shown to be time-management, which consists of planning, scheduling and prioritizing daily tasks and goals. To create an eHealth approach that influences the goal-management behavior of students with stress related problems, this study uses the "Right on target" intervention from the "Raise your strengths" stepped care approach. This approach was developed to help chronically ill people to adapt in a flexible way to goals that are threatened by their disease through use of different goal-management strategies.

In this study, six college students participated, two of them in the first two interviews and further four in the usability test. They were chosen based on convenient sampling. A qualitative research design has been chosen to determine, what the actual self-management behavior regarding stress problems of the sample of students is and to ascertain their needs and preferences regarding persuasive and design features of an eHealth application. A low-fidelity prototype was created based on these findings and used in a structured usability test.

The first interview confirmed that ineffective time management is a problem that influences the perceived stress. With the second interview it was shown that there are many persuasive features like personalization, praise and reminders which are regarded as useful by this target group, while their attitude towards social elements for a stress-management prototype was rather negative. The usability test demonstrated that the design of the low-fidelity prototype is logical, and the tasks are perceived as useful, nevertheless, the overview can be better structured and further features added.

Another usability test is needed with focus on the prototype's content and a bigger sample should be used to get more consent regarding the features of the prototype. Additionally, more research is needed to demonstrate that an eHealth approach using the "Right on target" tasks can improve the self-management behavior of students and subsequently lower their stress in the long run.

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Introduction

In the past decades, different studies have shown that the number of students experiencing mental health problems and even committing suicide has risen (de Beurs, Van Dyck, Marquenie, Lange, & Blonk, 2001; Mowbray et al., 2006; Bayram, & Bilgel, 2008). The dominating problem that lead to this rise in mental health issues, is the stress students experience (Misra, & McKean, 2000; de Beurs, Van Dyck, Marquenie, Lange, & Blonk, 2001; Bayram, & Bilgel, 2008). Many studies have been conducted to examine why students seem to experience such an high amount of stress and came to the conclusion that students are exposed to many stressors like financial problems, exam performance (Misra, & McKean, 2000; Andrews, & Wilding, 2004) and health related issues (Misra, & McKean, 2000). Nevertheless, the biggest stressor has been shown to be time management, because study related issues, e.g., deadlines, learning for exams and lectures have to be organized, next to work and finances, and the private life, e.g., friends, sleep and household duties. This leads to a lot of pressure and the need to manage the limited time wisely (Alzahem, Van der Molen, Alaujan, & De Boer, 2014; Heins, Fahey, & Leiden, 1984; Misra, & McKean, 2000).

The problem of stress in students, due to different stressors, is not a minor issue as a recent study from Bakker and colleagues (2017) showed that 62 percent of the 551 respondents of students from the University in Groningen, experienced constant stress in their student life. Moreover, a well-being research report from the UniHealth (2017) platform in UK shows that 82 percent from over 1000 participating students report to suffer from stress. Furthermore, the number of students has risen over the last years, e.g., in Germany. In 2004/2005, about 2 million

students were officially enrolled, while in 2018/2019 there have already been almost 3 million students (Unterberg, & Spiegel Online, 2018). In the Netherlands, the rise is not as steep as in Germany, but statistical forecasts also predict a slight raise in the following years (Onderwijs, & Wetenschap, 2018). There is a general rise in people who enroll in university and subsequently a rise in students with stress problems (Marx, 2016).

Stress experienced in high amounts goes along with problems that are cognitive, like problems with concentration, memory and organization, emotional, like constant worrying and feelings of anxiety, as well as behavioral, like the loss of appetite (Butler, 1993). For students, these cognitive effects can reduce their academic achievement due to the lack of concentration and memory problems, which influence the learning ability. Moreover, problems with time management and organization often lead to cramming, which lowers the academic performance and in turn self-esteem. An emotional problem students experience is the constant fear of failure due to the pressure experienced through the demands of their studies. This can lead to depression and anxiety problems (Saipanish, 2003). Behaviorally, academic stress can adversely influence personal relationships with others due to lack of time for family and friends (Saipanish, 2003). The loss of appetite and problems with sleeping are also mentioned consequences (Lund, Reider, Whiting, & Prichard, 2010; Misra, & McKean, 2000). In the long run, a high amount of experienced stress can lead to severe mental consequences and to failing or quitting their studies (Hammen, 2005; Saipanish, 2003; Qin et al., 2015).

In order to withstand the effects of stress and keep studying with a high well-being, different techniques are used by students to self-manage the stress and cope with its effects. A study from Beiter et al. (2015) describes the importance of good planning, e.g., the planning of

meals and finances, and the use of a financial budget. Another study by Phinney and Haas (2003) found that positive coping with stress by students often includes seeking support from friends or study advisors to talk about the experienced stress. To deal with the biggest stressor, time management, students were found using goals, making to-do lists, and scheduling and planning appointments (Credé, & Kuncel, 2008; Misra, & McKean, 2000). Furthermore, the study of Macan et al. (1990) described that students reported less feelings of tension and a higher feeling of control when they felt their goals are clear and defined.

To help students improve their self-management behavior and well-being and reduce the negative effects of stress, this study will use Positive psychology by focusing on what students can do and change about their self-management behavior regarding stress. Positive psychology emerged in the mid 20th century due to the believe, that human mental-health is not only the "absence of disease or infirmity" (World Health Organization, 1946). It was shown that many people who suffer from mental illness, even when not cured, are able to live a "happy" life. Studies showed that the use of their own abilities and strengths improves the well-being even while having a mental illness (Keyes, 2000; Seligman, 2004). Regarding this study, it is therefore possible for students even while being exposed to different stressors, to still have a high well-being and feel less stressed. Tummers (2018) has described in her book "Stress management: A wellness approach" (2018) the importance of stopping to focus on what is not possible to deal with the situation and instead focusing on how the own abilities can be used to deal with it. Furthermore, she describes how changes in actual self-management can influence the well-being by prioritizing, what actions are helpful to feel less stressed and, which are not (Tummers, 2018).

To make the decision, which actions are helpful, and to define clear goals to reach desired outcomes to feel less stressed, goal management strategies can be used which help to adapt to difficult situations and circumstances like situations that are stressful in a flexible way (Arends, Bode, Taal & Van de Laar, 2013). In order to reach desired goals, it is often needed to adjust them to the personal circumstances to be able to maintain them (Gionta, 2009; Voltolina, 2017). It is also possible that some goals do not fit the personal circumstances or are less important than others in a given situation and have therefore to be let go or replaced by new goals. A study from Wrosch, Scheier, Miller, Schulz and Caver (2003) showed that students who let go on unreachable goals reported a higher well-being and less feelings of stress. In order to get a clear overview, which goals are helpful or not, this study will use the Integrated Model of Goal management as used in the study from Arends, Bode, Taal and Van de Laar (2013), which combines two goal management theories, the dual process model of assimilative and accommodative coping and the Goal adjustment model. This combination leads to four goal management strategies, namely goal maintenance, goal adjustment, goal disengagement and goal reengagement. Goal maintenance and goal reengagement are strategies, which focus on keeping goals to achieve them, while goal adjustment and goal disengagement focus more on how goals can be adjusted or dropped to fit the personal situation (Arends, Bode, Taal & Van de Laar, 2013).

These goal management strategies will be presented in this study to the focus group students with the use of the existing stepped care approach “Raise your strengths”, created by Yvon van Veen, Nienke Peeters, Prof. Dr. Ernst Bohlmejer and Christina Bode together with the institution Vitaal mensenwerk and Agis (2018). This stepped care approach was used in doctor’s offices and consists of 3 steps. It was created, to help people with chronic illness with their self-

management behavior by raising their awareness of their own strengths and how these can be used in the first and second step of the approach, and by improving their goal-management behavior in the third step. The third step, which uses the goal management focused "Right on target" intervention (Arends, Bode, Taal & Van de Laar, 2013), will be used in this study. It was created to raise the patient's flexibility, when coping with goals, which are more difficult to achieve due to the chronic disease by learning to adjust different goal management strategies to their situation. It contains 3 sessions where, with the help of worksheets, the patient learns goal management strategies to be able to adjust the goals and learn, which activities are really priority and, which possibly hinder them in their daily life. This goal management part therefore helps the patients with the setting of their goals and deciding on priorities. The "Right on target" worksheets will be incorporated in the following approach to reduce stress in students by integrating the goal management strategies, so that those can help them to get a feeling of control by providing a good overview of their own goals and tasks and reduce worrying.

Although the "Right on target" intervention was used in cooperation with mental health nurses and general practitioners, the following intervention will not do so. In contrast to the already existing intervention, the focus group in this study are not chronically ill people. For the interview partners, students with stress problems, it can lead to even more stress if they have to also plan and organize meetings into their already stressful daily life and adjust their time management accordingly (Saipanish, 2003). Furthermore, for some people, talking to a general practitioner or mental health nurse, especially when they do not know them, increases stress due to feelings of anxiety (Gould, 2017). In order to not stress the target group even more, a possibility to use the goal management intervention easily and without additional stress, is needed.

The decision is therefore to develop an eHealth approach and to utilize technology to adjust the goal management behavior of students and to lower this way the level of stress. In this approach the convenience eHealth offers is the strongest reason to use an electronic device or website to enhance stress management behavior. The end users, students, which are facing stress, get the opportunity to have something directly in hand when facing stress (van Gemert-Pijnen, Peters, & Ossebaard, 2013). Another advantage is the possibility of tailoring the product to the user by adjusting the eHealth application to the different needs and stress resilience levels of the users (van Gemert-Pijnen, Peters, & Ossebaard, 2013). Regarding the target group, using a technical device is therefore a sensible choice, because almost everyone has the possibility to connect to the internet and in the Netherlands, 13 of 17 million Dutch people own a smartphone (Newzoo, 2018). Current students have been raised with technology, are familiar with its usage and are also the group, which uses the internet the most (Kezer, Sevi, Cemalcilar, & Baruh, 2016).

In order to gain a behavioral change in the target group, i.e., to change their goal-management behavior, with the usage of an eHealth approach, behavioral change techniques will be used. The determinant perceived stress does not have a direct influence on organization behavior like the organization of goals, rather it influences mainly the perceived behavioral control and self-efficacy of people, which in turn, influences the organization behavior. In order to perform a beneficial self-management behavior, a feeling of control and the believe that one is capable of taking the steps needed to reach a desired outcome or perform a certain behavior, must be given (Lorig, & Holman, 2003; Zajacova, Lynch, & Espenshade, 2005). To raise the perceived behavioral control and the feeling of self-efficacy, and regarding the goal-oriented part of this eHealth approach, the Goal setting theory (Latham & Locke, 1991) will be used, to split

overly ambitious or stressing goals and activities into smaller ones. The user will be able to formulate (sub) goals and learn with feedback, to stay motivated and to self-monitor behavior. This will, among others, be achieved with the help of the goal management-oriented tasks from the “Right on target” intervention, which will be incorporated in a low fidelity prototype. Furthermore, to make the low-fidelity prototype appealing to the user, persuasive features from the Persuasive System Design from Oinas-Kukkonen and Harjumaa (2008) will be used to improve the goal-management behavior of the students (Appendix F). This Persuasive feature model is split in tables of 4 categories. The first is the primary task support, which focuses on, e.g., the personalization a technology should offer. The second one is the dialogue support with principles like, e.g., reminders and praise. In the third table principles to support system credibility can be found. The last table deals with principles regarding the social support and the communication from the user and other users. These persuasive features should, when incorporated into the technology, make the prototype attractive for the target group and persuade them to use it.

To use the right behavioral change techniques and persuasive features that match the target groups needs and preferences, the low-fidelity prototype will be designed in collaboration with interview partners, students with stress management problems. In this way, the probability should be raised that the created low-fidelity prototype will be used to get a behavioral change, a more adapted goal management which matches their own needs and circumstances to reduce stress (Abras, Maloney-Krichmar, & Preece, 2004). Without the collaboration of possible end users, it can happen that the low-fidelity prototype will miss out on important elements, which are important for the users to really be helpful, and that the users would have difficulties with the usage (Abras, Maloney-Krichmar, & Preece, 2004).

Research question

Most studies, which use a goal management eHealth approach were conducted for ill people, while almost none used this approach to prevent further illness, and thus mental and physical problems resulting from stress, by improving the actual stress-management behavior and reduce feelings of stress. Therefore, this study will use the "Right on target" intervention to help students with the management of activities and goals, how to decide on their importance, to obtain an overview over those, and raise their well-being. The research question is: What does a goal management-oriented eHealth approach, based on the "Right on target" intervention, need to include to positively influence stress and goal management behavior in the target group students?

This question will be split into four sub-questions, which are based on the first four steps of the CeHRes Roadmap (van Gemert-Pijnen, Peters, & Ossebaard, 2013), which can be used to improve the structure and plan the creation of an eHealth technology. These first four steps are contextual inquiry, value specification, design and operationalization. The formulated sub-questions are:

1. What is the actual problem students face concerning the self-management behavior in stressful situations?
2. Which needs and preferences do the patient partners have regarding the persuasive features and design in the chosen technology, to positively influence the stress management behavior in students of the University of Twente?
3. How should the chosen technology be designed, taking into account the patient partners opinions, regarding persuasive features and behavioral change techniques to positively

influence the stress management behavior in students of the University of Twente?

4. In how far is the created eHealth technology understandable and easy to use for students with stress problems?

Methods

Design

To answer the Research questions, a qualitative research design with semi-structured interviews will be used.

Participants

For the first two interviews, 2 German female students from the University of Twente were interviewed. The third interview, the usability test of the low fidelity prototype, was conducted with the 2 students from the first interviews and further four students from the University of Twente, 3 female students and 1 male student (M_{age} = 23,34 years, age range: 20-32 years) . The demographic information from these six participants is shown in Table 1. The inclusion criteria were that the participants were actually students, above 18 years old and experienced self-reported stress due to their studies. The nationality or gender were neither an inclusion nor exclusion criteria. Furthermore, the participants were chosen based on their availability, thus a convenient sampling was used. The study was approved by the ethics committee from the BMS faculty at the University of Twente (Appendix A).

Table 1

Demographic information

Characteristics		N
Gender	male	1
	female	5
Age	Mean	23
	Range in years	20 – 32
Nationality	German	5
	Dutch	1

Materials

In order to interview the two interview partners and meet the ethical and legal requirements, an informed consent was used, which states that they can withdraw from the interviews at any time, that their personal information will be changed so they are not identifiable and that they agree being recorded (Appendix C).

A semi structured interview scheme was created to answer the first research question, i.e., what the actual problem is students face concerning their self-management behavior in stressful situations. It contained open questions about their general impression of their studies, what stress means for them and in how far they experience stress due to their studies. They were questioned, in how far this stress impairs them in their daily and social life, e.g., "*Did/Do you experience any impairments in your daily and social life because of the stress?*". Moreover, the participants were asked about their self-management behavior, e.g., "*How do you manage the stress problems if*

they come up?" and "*What problems do you experience with your self-management?*". Furthermore, they were questioned if they ever consulted professional help to cope with their stress problems.

The second interview was about the patient partners usage of technology and how the eHealth approach should be designed in order to help them manage their stress problems. At first, they were asked which technology would be suitable regarding the eHealth approach. Taking into account the problems they mentioned regarding the stress management it was asked "*Do you have an idea how a technology could solve those problems*?". Moreover, a table with persuasive features (Oinas-Kukkonen, &Harjumaa, 2008) was given to them and they were asked, which persuasive features they think are useful and which are not. Next, the interview partners were handed the "Right on target" worksheets and asked "*You have seen the goal focused worksheets, do you have any idea about how you would like to see them in a eHealth platform*?". Finally, they were asked if there are other elements, they would think could be useful, e.g., "*Are there any other elements you can think of that you want to include*?".

The low-fidelity prototype was created with the prototyping application "marvel". Here, the goal-oriented, "Right on target" worksheet exercises (Appendix G) 1D till 3A were used. Those chosen exercises are 1D "Taking stock", 2A "goal pyramid", 2B "Importance of the main goals", 2C "Threatened main goals", 2D "select an important activity" and 3A "Actions for a threatened activity". All these tasks mainly focus on how to select and adjust goals and are therefore fitting in this eHealth approach. To design the prototype, screenshots of the worksheets were used and features, like a Home symbol, an arrow icon and background pictures from the application "marvel" were incorporated. The application prototype was used in the third

interview to test it.

The third interview, the usability test, a structured interview scheme was used, which contained tasks based on the designed low fidelity prototype, ranging from easy, like typing in the name, to difficult, where they had to do a task from the “Right on target” intervention. All interviews, including one and two, have been recorded with a mobile phone

Procedure

The first interview was conducted with each of the two patient partners and took about 30 minutes. The interview procedure was explained to the two patient partners, information about the “Raise your strengths” stepped care approach and the “Right on target” intervention was given (Appendix B), and the informed consent signed when the partner agreed to take part and there were no further questions (Appendix C). Afterwards, with help of interview scheme in Appendix B, the two partners were interviewed to obtain more information about the stressful situations they experience and the problems resulting from it, specifically regarding their self-management behavior. The second interview (Appendix D), taking also about 30 minutes, was about the technologies they use and what they think an eHealth technology should include to be helpful, easy and effective. Here, also the work sheets “right on target” were shown to determine how they could be incorporated in the prototype. The same was accomplished with the table of persuasive features from Oinas-Kukkonen and Harjumaa (2008).

With help of the findings from the first two interviews, the design process started. Behavioral change techniques and persuasive features were determined, based on the needs and wishes of the patient partners in interview two, but also on their self-management problems in

interview one and how those could be solved. Subsequently, the third interview took place. Six people, including the two patient partners, performed a usability test with beforehand determined tasks ranging from easy, to modest, to difficult. The participants were informed, that they are going to see a low fidelity application where they can click through but not type something in or swipe. If they agreed to take part, they signed the informed consent. First, each of the six participants got three minutes to click through the application and get to know it. The participants were asked to think aloud. After these three minutes they were asked if they are ready to start with the tasks. If they were ready, they were first asked to complete 3 easy tasks, to type in the name, to select a password and to skip the tutorial. Next, modest tasks were given, which were to take a look at the long-term goals and to select all to-do list tasks as done. Lastly, they were asked to complete 3 difficult tasks, to watch the tutorial again, to fill in 2 goal pyramids in the goal pyramid task, and to do the "possible actions" for a threatened main goal task. The participants completed these tasks and any problems were recorded. Afterwards they were asked for feedback and recommendations regarding the design and structure of the prototype.

Data analysis

All four interviews and all six usability tests were transcribed verbatim. The names were changed in all interviews and tests to ensure anonymity. The software Atlas.ti was used to develop a coding scheme. To code all interviews and tests, an inductive approach was used to answer those. The codes were chosen based on the transcripts of the interviews and tests, the topics that occurred and how often these were mentioned. These specific codes were then grouped into more general categories. The codes and categories have been adjusted with the

feedback of the first supervisor until the final coding scheme, which answers the Research questions most adequate, was reached. The chosen quotations are those which show most concrete what the category and code is about. For the first interview, the final categories are "*Difficulties in stressful situations*" and "*Self-management behavior*". The categories for the second interview are "*Technology*", "*Persuasive features to include*", "*Persuasive features to exclude*", "*Design*" and "*Other features additional to worksheets*". For the usability tests, two categories have been chosen, the "*Procedure*" and the "*Design*" category.

The low fidelity prototype was built based on the insights of interview 1 and 2. From the first interview, the self-management problems mentioned were taken into account to create features for the prototype, which should make the self-management less difficult. With the results of the second interview, the preferences and needs of the two interview partners regarding persuasive features, additional features and design were taken into account. To do so, persuasive and design features were incorporated, which were mentioned by both interview partners. If a wish, shared by both, was described by one very specific and by the other more general, the more general wish was used in order to meet the basic wish of both. Features that were named only once were integrated when not interfering with the wishes and needs mentioned by the other interview partner. Lastly, a psychological theory, the goal setting theory from Latham & Locke (1991) was chosen and used in the prototype, to improve the self-management behavior by splitting goals into smaller sub-goals which can be reached with less effort and therefore stress.

Results

In the following chapter the Research questions will be answered. The first and second question will be answered with a table of codes and an explanation. The third question will be answered with help of the first two interviews, the persuasive features mentioned by the patient partners and the chosen behavioral change techniques. The prototype will be shown, and the design will be explained. To answer the fourth Research question, again a table of codes and an explanation will be used.

1. *What is the actual problem students face concerning the self-management behavior in stressful situations?*

To answer the first Research question, the most important categories and codes from interview one with both patient partners will be discussed (Table 2). The categories are the difficulties in stressful situations and self-management behavior. An extended version of the Table can be found in Appendix H.

Difficulties in stressful situations

The first thing to mention, is that both patient partners describe the experience of high stress as periodically, e.g., for one was the stress higher in the second year, for the other at times, when there was a lot of work in addition to studying. Furthermore, they stated that the bachelor study is more stressful than the master study and that the winter months are especially challenging, due to the weather with less sunshine but also due to more work in their jobs before the holidays. Both participants experienced difficulties in health due to the high levels of stress, one with mononucleosis and the other with a thyroid dysfunction. One of them also had

depressive episodes. The difficulties in daily life were mainly the lack of time for daily activities like going out with the dog, sleeping, or cooking. They both stated more impairment in social life, with social contacts that could not be maintained, friends who got upset due to less shared time and also not being able to take part in social activities like parties with other students. Regarding the difficulties in their studies, both mentioned the same problem, that due to the stress and a lack of time they both were busier with passing exams and assignments and could not give all to reach high grades.

Self-management behavior

Due to the problems the interview partners experience, both mentioned that the problem concerning the self-management behavior is time management, which means that they constantly have the feeling that they are always running low on time. Both said that the setting of priorities is important to manage time effectively, but in order to do so, they always have to cut down on activities, e.g., sleep, learning time, spending time with friends or take care of themselves. To overcome this time management problem, both tried to self-manage their time by developing a schedule, writing a bullet journal, review their own study techniques and also exercises of the mind to relax and focus. Furthermore, their self-management behavior included to plan when to meet with friends or parents to lessen the stress. To have less work, they also divided the daily tasks with their partner. In summary, it can be stated that, even though both try to effectively manage their time, they experience difficulties with time management. The problematic self-management behavior therefore seems to be the time-management and the setting of priorities to feel less stressed and not to be overwhelmed.

Table 2

Coding scheme - Difficulties in stress situations and Self-management behavior

Category	Code	Frequency	Example quote
Difficulties in stressful situations	Stressful periods	6	most stressful period was in my second year (R1)
			in December I have to work 60 hrs per week. So, it's more than full time and after that I have to study for exam (R2)
	Difficulties with Health	16	when I ended this module, I actually got mononucleosis, so I was ill for 4 weeks and I think, at least that's my thought, I think this was basically because I had one and a half months of pure stress and panic. (R1)
			because of a lot of stress my cortisol and prolactin changed, and my body is the whole time fight fight fight fight like this. And this over years and years and that's the reason that I have problems with my thyroid (R2)
	Difficulties in daily life	6	You have to work, you have to study, you have to do homework, you have to care of your child. You have to care for your dogs. You have to care for your family. And I am like I don't know I want to care for myself. One hour a day but there is not time (R2)
			moving out from home, being on your own, having to be an adult (R1)
	Social difficulties	11	I couldn't maintain all the social relations I had before my study because there was just so much work and so much stress (R1)
			while the other students meet up and enjoy their evening or nights by party or doing stuff, I was always working. (R2)

Table 2 continued

Category	Code	Frequency	Example quote
	Study related difficulties	31	I had to cut back on the quality of my study because I was just not able to give my all (R1)
			I passed but I could pass with better with better grades (R2)
Self-management behavior	Current self-management	35	I have to organize myself a lot and I have to really keep to a schedule (R1)
			now I am doing a bullet journal when I started working last year (R1)
			But I think it's really important in coping with the stress to have that after a planned time of learning, e.g. from 9 to 3, that afterwards you are really done and don't study anymore and have time for your friends. (R1)
			So, everyone does one part and not one person everything. We support each other. (R2)
	Problems with self-management	19	I wanted to give more but I was just not able to do it, because otherwise I would maybe have failed another course or something like this and I think you really have to prioritize what's more important (R1)
			I need more time. That's a problem. I need more sleep. More hours a day and at nights (R2)
			And I am like I don't know I want to care for myself. One hour a day but there is not time. (R2)

**R = Respondent*

2. *Which needs and preferences do the patient partners have regarding the persuasive features and design in the chosen technology, to positively influence the stress management behavior in students of the University of Twente?*

This second Research question will be answered with the categories and codes from the second interview with both patient partners (Table 3). The categories that are going to be discussed are first the chosen "Technology", then the "Persuasive features to include" and "Persuasive features to exclude". Moreover, the "Design" and "Other features additional to the worksheets" category, which the patient partners see as useful, will be discussed. An extended version of Table 3 can be found in Appendix I.

Technology

The second interview has shown that both participants clearly prefer an eHealth application for this approach. Both use their smartphone daily and think that an application is the fastest, cheapest and easiest way to use technology because everyone has a smartphone and they both use other technologies less.

Persuasive features to include

There are several persuasive features they think could be useful in the technology. Reminders were mentioned often by both participants, as a possibility to get prompted of important appointments, deadlines and goals. This would help them to focus on their tasks without having the fear of forgetting, e.g., an important appointment or deadline. Furthermore, both liked praise, together with a form of the persuasive feature reward, like a funny phrase or a cute animal, because both stated that this could keep them more motivated during stressful

periods. Additionally, both participants wanted some expertise in the prototype that the application was designed by knowledgeable people from a university and not just by a trendsetter. One respondent mentioned this would raise the feeling that the one who designed the application actually cared about the target group instead of just wanting to make money. The other respondent mentioned that this would make the application more credible because it was scientifically researched. Similarity, that the app was designed by a student, with which the target group can identify, was also mentioned. The information, that the application was designed by a student from a university, could be part of the background information in the application, said one patient partner. Furthermore, personalization was mentioned, as the application should be easy adjustable to the users wishes and needs because they can change over time. One patient partner referred to this personalization by stating that especially their own goals should be easy to adjust (Table 3). Further persuasive features named by the patient partners, without explanation why they could be useful (Appendix I) were tailoring, that the application should be adjusted to the target group, which was seen as almost the same as personalization, the possibility to adjust to individual needs (Appendix F). Also, reduction, to perform the target behavior the prototype should help splitting complex behavior into more simple tasks, and self-monitoring of their own goals and tasks, were mentioned. Lastly, the system should also be visually attractive for the user, so liking was mentioned.

Persuasive features to exclude

Both patient partners agreed regarding the persuasive features, that the application should not contain any social elements. They both view their organization, management, and goals as something personal, which they do not want to share or to compare with anyone else. Specially the social comparison was disliked because it would cause more stress comparing their own achievements with others. Moreover, the reminder function should be designed with the possibility to turn it on and off and no "*use the app*" reminder should be used. This was described by one patient partner as causing more stress because of the feeling that next to all the appointments and things that have to be done, the user has still to use the application. The effect of a "*use the app*" reminder would therefore be counter-productive.

Design

Regarding the design both patient partners wanted rather muted colors and a minimalistic design, so that the colors and details do not distract from the main goal of the application. One patient partner referred here to another application where mainly green and natural colors were used. The other patient partner showed an application with many colorful symbols on one screen, which the patient partner mentioned as too distracting and confusing. An introductory tutorial on how to use the application, which can be skipped and re-watched when needed was also mentioned by both. They also agreed that the application should have a clearly structured overview to not cause any more stress. Their main wish was that it is "*easy to use*". Also, the atmosphere was mentioned, the application should not be too serious but more relaxed, by using a nice character to lighten up the mood (Table 3). Other needs mentioned by always one patient partner were the brightness, that the application should not be too bright so that it is easy to view

for a longer time, it should be available all the time and designed in a way that the user can decide when to fill in the tasks and options (Appendix I).

Other elements additional to worksheets

Other elements they mentioned as useful in the application were background information, to know the theories behind the tasks and with what goal the application was built for. Due to the fact that both use an agenda they also wanted to see one in the app, to type in appointments and important meetings. Lastly, a to-do list was mentioned as really helpful to watch their own progress and achievements when checking items on the list as done. This was mentioned as motivating due to a positive feeling when the user is able to see how much work is already done.

Table 3

Coding scheme - Needs and preferences for features from the patient partners

Category	Code	Number of codes	Citation
Technology	Technology preferred for this eHealth approach	4	Yes, definitely an app I can use on my phone all the time. I don't have the time to use something fancy like virtual reality and I don't have the resources to use it and my smartphone, it is always by my side so this would be the most handiest for me. (R1)
Persuasive features to include	Reminders	7	Maybe that you even can at the end of a month or a week that you get like a end result like wow this week you fulfilled so many goals and I just want to give you a quick reminder that these are your long term goals, so mainly that you can really see like a process how far you've came. (R1)

Table 3 continued

Category	Code	Number of codes	Citation
	Praise	6	I always like the praise you get when you achieved something and there is like a little mascot from the app (R1)
			You put it in a to do list and if you have achieved more than the half of your to do list in a day, then you would get a clap or Yeah great job. In words or the sound of a clap (R2)
	Expertise	4	That the app is done by experts and not by… That It's not like a hobby of someone but like some experts behind it. Yeah. I need experts for everything. (R2)
	Rewards	3	rewards or something like this, I think maybe when you are rewarded for something you do or that you were supposed to do, I think that would be really good (R1)
	Similarity	1	I think it always adds a really nice touch if you see that it was made by students because I feel like and I'm a student myself and I can better identify with them and you feel like it is more and I always have the feeling that if it is made by students it is not about money making but that they gave their all to make this app …I think it always gives you the feeling that the person really cared about the consumer (R1)
	Personalization	3	I think there are goals you have in the longer run but there are also goals you have like for a week or for a specific period and they can change so it shouldn't be like all is fixed (R1)
Persuasive features to exclude	Social support	5	I wouldn't want something like social comparison or competition or anything because that is more stressing and I feel like I'm not the person who always wants to share how far I have come because I don't want to compare myself or how fast I am working on something or compared to someone else, because I think it is much more stressing (R1)

Table 3 continued

Category	Code	Number of codes	Citation
	Use the app Reminders	1	Especially I don't want any "use the app" reminders … because than I will be stressed again because this would add another element where I would think like shi*t, I still have to use the app and the app should actually help me to feel less stressed (R1)
Design	Colors & decoration	5	Minimalistic is a good term… Because too much colors and attention of biases put stuff like this. And if the app is good and the qualitive part is high you don't need much extras. I think stuff that has a lot of extra functions… A little bit to disguise that it is totally shit. (R2)
	Introduction/ Tutorial	4	To be able to skip it and to re-watch it and it has to be short and simple. And keep it very very short and simple because people who are using application want assistance and not extra work. So no video. It should reduce your stress, it should not you put more .. higher level of stress. I don't know how to use this. (R2)
	Overview	3	I think that is the most important thing about a goal / organization management app because if you are stressed your life is basically a mess so you need to have some structure and if the app is like filled with decoration and bling and something pops up there and there then it's not helpful because you have to have something that is clear, which gives you overview, this is what you should concentrate on, this is what you should focus on, if you want you can adjust this but that is the main thing you have to do. (R1)
	Usability	3	I don't like complicated apps. … It must be easy to use. (R2)
	Type of questions	3	They must not be easy they must be time limited. one minute per answer. Something like this Not causing more stress (R2)

Table 3 continued

Category	Code	Number of codes	Citation
	Atmosphere	1	It should really be a nice character who relaxes the atmosphere a little bit, who makes it all a bit more relaxed and calm so that it is not that serious. I don't like super serious apps that are like "We're gonna work on your problem", but something that lightens up the mood. (R1)
Other features additional to worksheets	Background information	3	But what I personally like I have this one app where you can click like on an info button so that you get some background information, where the theory is coming from, why it is helpful to use (R1)
	Calendar	2	It's like using an agenda. So I can write everything down. (R2)
	To-do list	2	To write down the most important things and to put and use a to do list. So you can see what you have done and what you have achieved. (R2)

**R = Respondent*

3. *How should the chosen technology be designed, taking into account the patient partners opinions, regarding persuasive features and behavioral change techniques to positively influence the stress management behavior in students of the University of Twente?*

The third Research question will be answered based on the findings from the second interview, the wishes and preferences from the patient partners regarding design and persuasive features, and also based on the findings from the first interview and the problems the patient partners experienced with the self-management. Furthermore, features will be explained which were used to make the prototype function logically but were not explicitly mentioned, e.g., a home button.

Starting to design, at first an introduction screen was created. To make the application look friendly and still use not to bright and rather muted colors, the whole application was created mainly in the colors green and blue. The colors were chosen due to the natural feeling that one interview partner especially liked in another used application. Holding account with the wish of the patient partners to have a friendly atmosphere by the usage of a character, Mr. Pebbles, a green friendly looking smiley was created which introduces itself at this first screen (Figure 1).

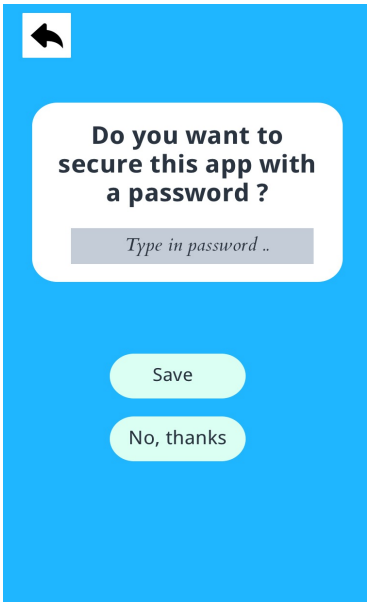
Figure 1

Following the first opening screen, the option to personalize the application was implemented in form of the option to type in the own name. Furthermore, on this and on every following screen an arrow to get to the next page was inserted to guarantee an easy usability as known in other applications. This function was not explicitly mentioned by the interview partners but was important to guarantee a logical flow through the application when used (Figure 2).

Figure 2

Next to the possibility to type in a name, the application offers the option to secure it with a password. This was implemented due to the statements of the interview partners, that they regard their to-do lists and goals as something personal they do not want to share. To give them the option to make the application fully private, a password can be chosen, but it is not mandatory to use the app. If the user does not want a password, then the user can easily skip this part (Figure 3).

Figure 3



Furthermore, the patient partners wanted a tutorial, which introduces and explains how to use the application, and which can be skipped and watched again at any time. This was ensured by inserting a skip button and the option to watch the tutorial again later under settings. The tutorial follows the password screen and is four screens long (Figure 4-7). On these screens the purpose of the application and the main functions are explained. Moreover, it is mentioned that the application offers more background information about the used intervention and the theories behind it in the settings option (Figure 7). This background information is given due to the wish of the interview partners regarding the persuasive feature "*Expertise*", to show that the application and the used theories are scientifically researched. In the tutorial it is also mentioned that the application was made by a student, to hold account with the wish for the persuasive feature "*Similarity*" of one patient partner (Figure 4). To keep the positive atmosphere Mr. Pebbles was used again (Figure 5, Figure 6, Figure 7).

Figure 4

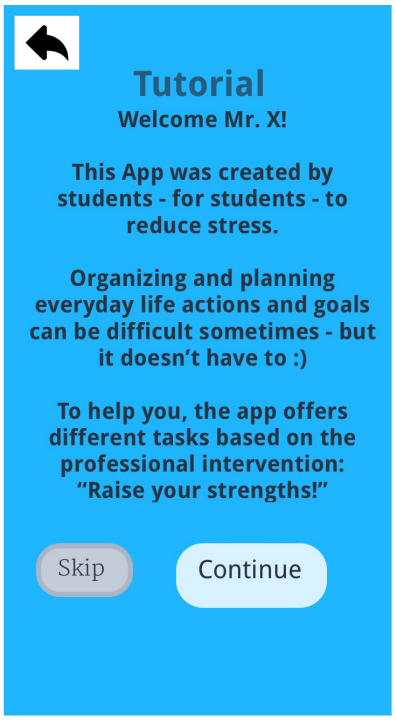


Figure 5

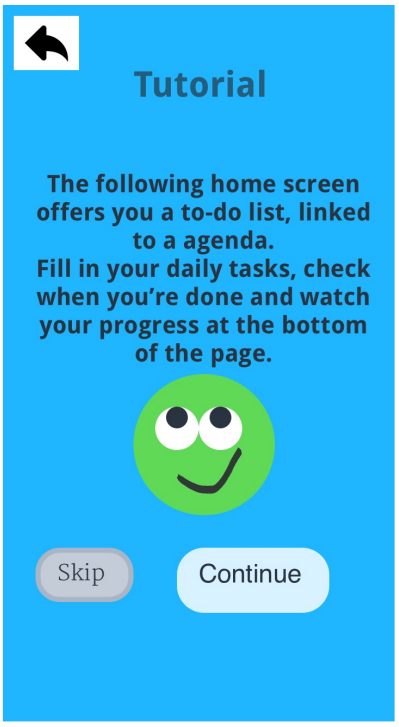


Figure 6

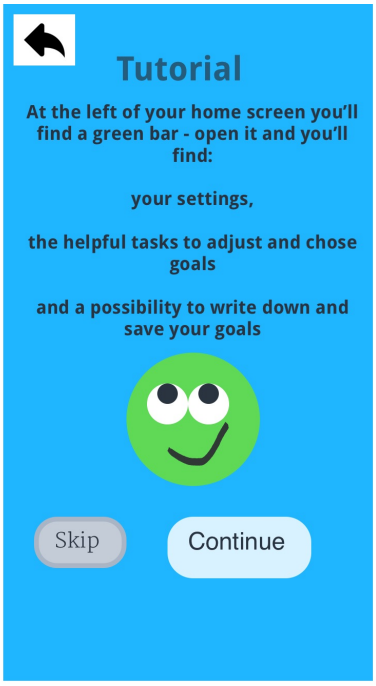
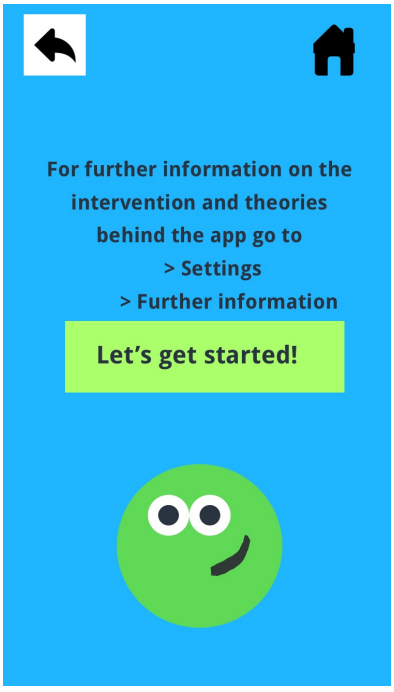


Figure 7



The tutorial is leading to the main, the home screen (Figure 8). This screen contains the wanted features adding to the worksheets, the to-do list which is placed in an agenda. Next to every to-do list task, which the user can type in, is a box that can be checked and to see the progress a circle at the bottom of the page will show how much percent have already been completed. To motivate the user and implement the praise and reminders, Mr. Pebbles, the friendly green smiley will pop up with a praising sentence when 100% of the to-do list tasks are accomplished (Figure 9). At the left of the screen will be a green side bar with an arrow, which can be clicked to open further options (Figure 8). In this way, the clear overview, which was important to both interview partners, should be maintained and only the most important things for the day shown at the main screen.

Figure 8

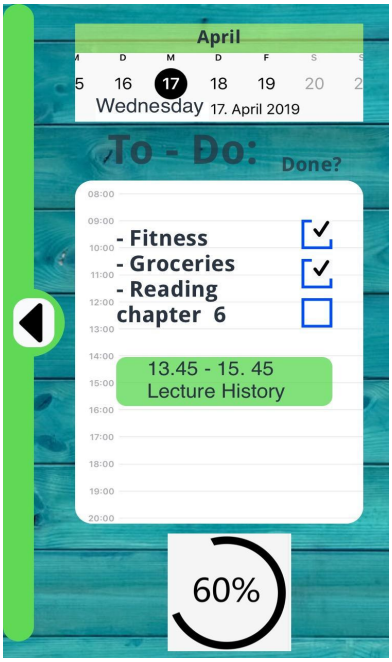
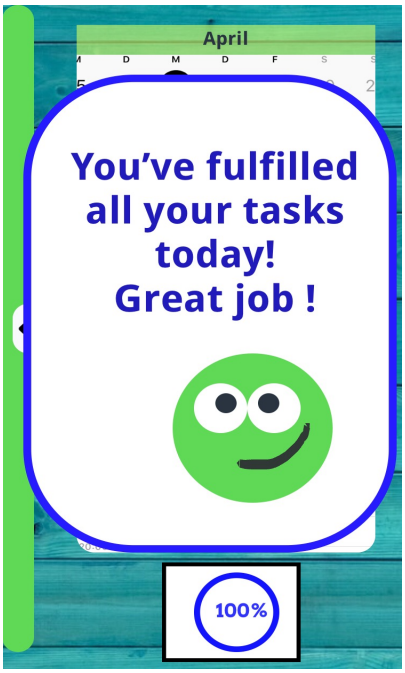
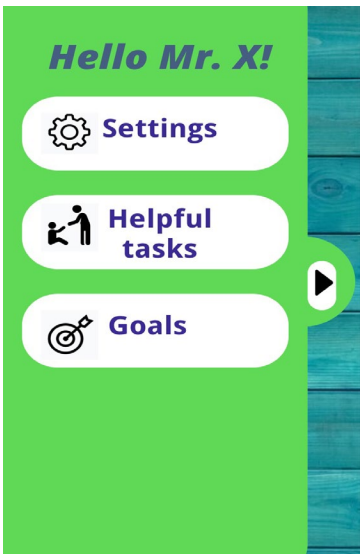


Figure 9



The green side bar will lead to a screen with a list of options. Here, a button for settings will be implemented, as well as a button for their own goals, which the patient partners wanted to be able to adjust and type in, and a button for the chosen tasks from the intervention “Right on target”, described as “Helpful tasks” (Figure 10).

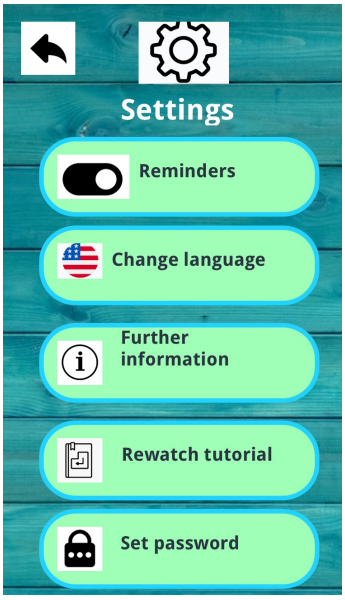
Figure 10



The settings button will lead to a further screen (Figure 11), where different options are offered. First, it will contain a reminder button which will lead to a page, where the reminder function can be adjusted. In accordance with the wishes of the interview partners, the user should here have the option to personalize if reminders for upcoming appointments and to-do list tasks are wanted or not and in which time interval. Furthermore, there will be no reminders to use the application. To personalize the application more, an option to change the language will be added. The third button, the further information button will lead to further information about the used intervention and the goal management theories behind the tasks. Also, the possibility to watch the tutorial again, as mentioned by one interview partner, will be given here. Lastly, if the user

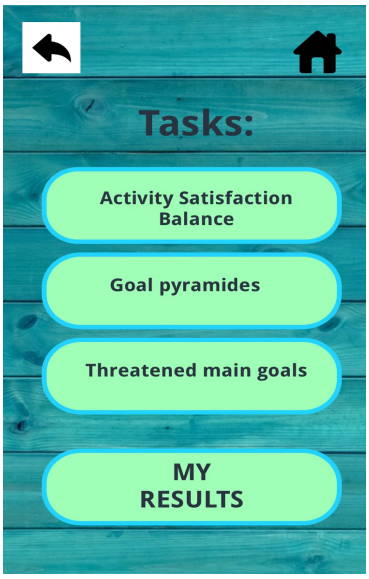
decides later on that the application should be secured by a password, this option will be also presented here.

Figure 11



The button “Helpful tasks” in Figure 10 will lead to the tasks chosen from the intervention worksheets from “Right on target”. The chosen tasks will be included, with exercise 1D “Taking stock” under the “activity satisfaction balance” button, 2A “goal pyramid”, 2B “Importance of the main goals” and 2C “Threatened main goals” under “goal pyramids” and 2D “select an important activity” and 3A “Actions for a threatened activity” under “Threatened main goals” (Figure 12). Moreover, each of the three tasks in the application will have a result summary following the “Results” button, so that the user can always re-watch their own results.

Figure 12



The text of the tasks will be split over several pages to keep the overview and the table in task 1D from the “Right on target” worksheets, will also be split with every row being at one page and showing the table later on as a summary (Figure 13 & 14).

Figure 13

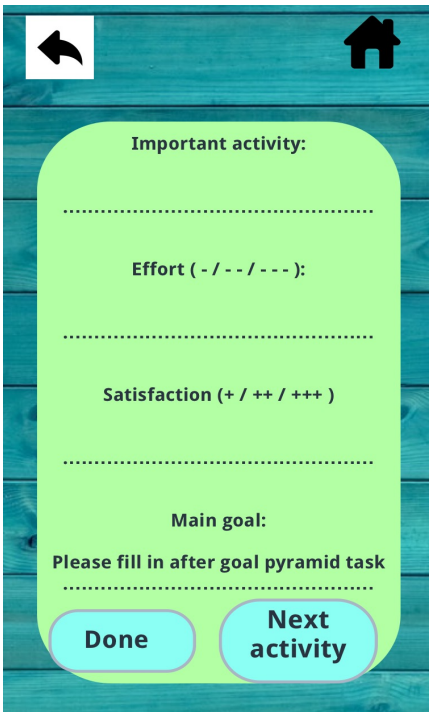
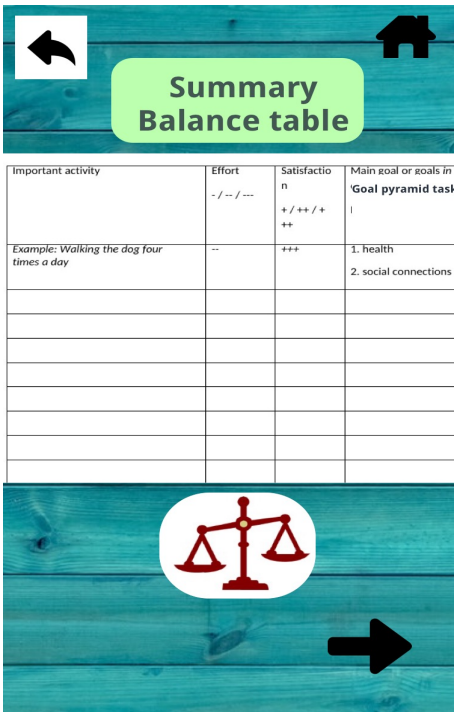
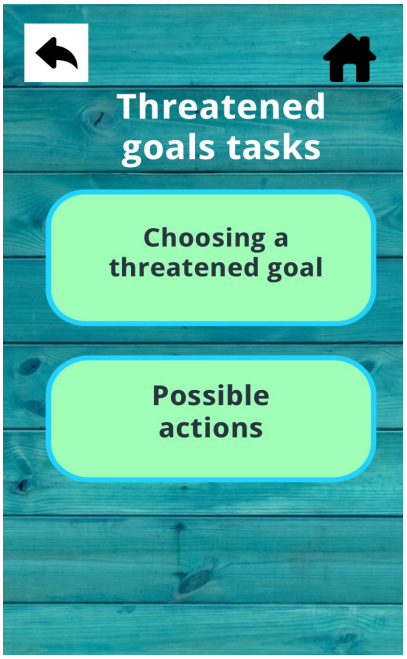


Figure 14



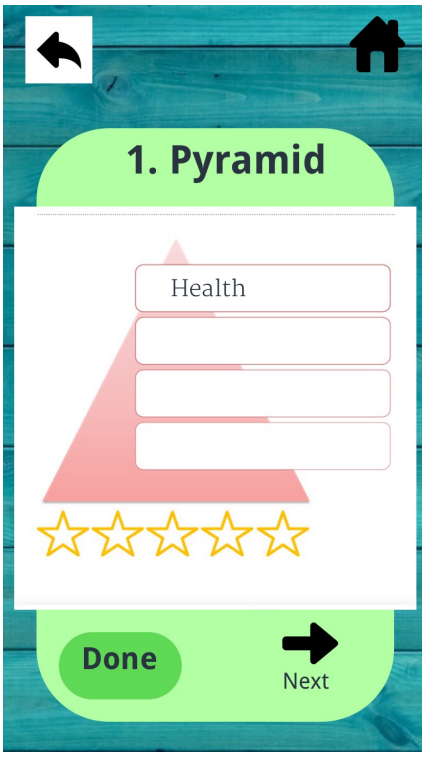
Furthermore, the task 2D “select an important activity” will be under “Choosing a threatened main goal” and 3A “Actions for a threatened activity” under “possible actions” (Figure 15).

Figure 15



As described, the stress management behavior should improve using the Goal setting theory (Latham & Locke, 1991), to split overly ambitious or stressing goals and activities into smaller ones. The user will thus be able to formulate (sub) goals and learn with feedback, to stay motivated and also to self-monitor their own behavior and the advantages and disadvantages. The possibility to split goals into smaller sub-goals is given in the chosen worksheet tasks from the "Right on target" intervention, especially in exercise 2, the Goal pyramid task, where daily activities from task 1D are written into a pyramid and higher goals of this activity are written in the layers above (Figure 16).

Figure 16



The last button “goals” in Figure 10, the options screen, will lead to a screen where own goals can be split further in short term and long term goals (Figure 17). Here again, the Goal setting theory from Latham and Locke (1991) was applied and goals split into smaller ones. Moreover, these screens were created because the patient partners wanted to be able to have their goals structured and be able to adjust them at any time. The short-term goals will be further divided into goals for a week or month. This should ensure the possibility to break down bigger goals into smaller ones, so that the user feels less overwhelmed and the goals can be achieved easier (Figure 18). To watch the progress, here again boxes, which can be checked have been placed next to the goals (Figure 19) and Mr. Pebbles will pop up when all goals are achieved.

Figure 17

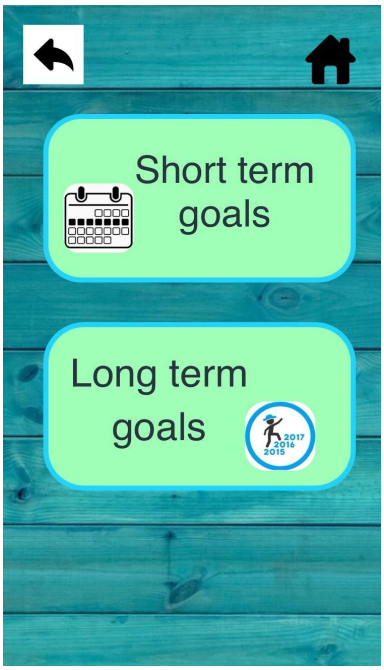
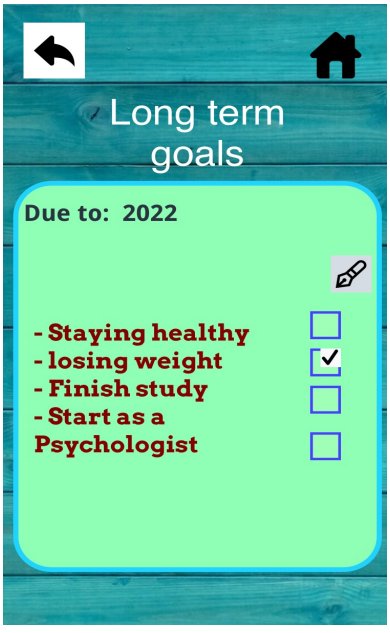


Figure 18

Figure 19



4. *In how far is the created eHealth low fidelity prototype understandable and easy to use for students with stress problems?*

In order to answer the last research question the usability tests with the six students have been coded and categorized. The chosen categories are “Process”, which describes in how far the tasks were easy to do and the low fidelity prototype logically build, and the “Design” to explain whether the participants found the design of the low fidelity type appealing and why (Table 4).

Process

Overall, all 6 participants described the low-fidelity prototype as easy to use and well designed. Of these six participants, four did not experience any difficulties and mentioned that they knew what they had to do. A problem came up at the difficult task, to fill in two goal pyramids, because two of the participants clicked at first on the “goal” button instead of the “Helpful tasks” button. The word “goal” was experienced as confusing, because they expected to find the “goal pyramid” task under “goals” instead of “helpful tasks”. Except of the goal pyramid task, the prototype worked as expected and the screens were logically ordered.

Design

Regarding the design of the low-fidelity prototype, all six participants liked the green motivational smiley Mr. Pebbles. The overview was explicitly mentioned as helpful and clear by three participants, especially because of the green side bar where the options buttons are so that only the important things are on the main screen. The following feedback was all only mentioned by one person, who prefered a better structure and overview in the tutorial, with less text on one page and more paragraphs, so that the texts in the tutorial and tasks are less overwhelming.

Participant 3 experienced it as annoying that 2 of 3 completed tasks in the to-do list were described as 60% achievement because it should be 66%. Participant 5 missed some examples under the pictures of the "possible actions" for a threatened main goal task. This participant also wanted some relaxing or meditation tasks, because this could be helpful in getting more distance to the stress and to be able to focus.

All in all, the recommendations have been very individual and differing from each other because not one of the six participants recommended the same preferences as the others.

Table 4

Coding scheme - Usability test results

Category	Code	Frequency	Citation
Process	Feedback	4	I did not have any difficulties (R1)
			it was clear what I had to do. (R3)
			it is pretty simple designed so I can handle it pretty easy (R4)
			The goal thing was confusing, the rest was logical. (R2)
Design	Positive feedback	8	And I really like Mr. Pebbles, he's a cute guy. (R1)
			I think it is very clear, I like the design and how creative you were with the menu on the left side because I can always very easily go to the menu and don't have to search it, everything important is on the main page, so I like it. (R6)

Table 4 continued

Category	Code	Frequency	Citation
			I think it's a pretty well-done app, a nice lay-out so I can see everything for the day, I can see the week, it is pretty simple designed so I can handle it pretty easy. I like the explanations before the tasks, so I really understand what is going on and why this is helpful. (R4)
	Recommendations	5	I would recommend to make the tutorial instructions a bit more, with a paragraph or maybe in a different bubble or that you have like maybe in those apps that you first see one sentence and then you click and the next comes up. I think this way it is not, it doesn't really stand out, the instructions and then it's like it's so much text and you have to read it over and over again and I would like it if the instructions come bit by bit. Like in the tutorial and in the tasks. I really like the examples because without I wouldn't understand it but yeah, more structured for a better overview. (R1)
			The only thing which is bothering me is that it states 60% but it should be 66%. But I like that it jumps to 100% when I entered the last task as done. (R3)
			Maybe in the threatened main goals part, with the possible actions, maybe under the pictures an example. It might be easier to come up with something when you have an example. What else….maybe something like, a meditation task or something that says okay, take a step back, take a deep breath, something to get some distance to the stress. (R5)

**R = Respondent*

Discussion

The question "*What does a goal-oriented eHealth approach, based on the "Raise your strengths intervention", need to include to positively influence stress-management behavior in the target group students?"* will be discussed in the following with the help of the findings from the fourth sub research questions.

The findings of the first question, "*What is the actual problem students face concerning the self-management behavior in stressful situations?*" have confirmed the findings found in the literature. The first interview showed four different aspects of life: health, social, study and daily life aspects, which are influenced by the stress the interview partners experience. These different aspects and that they are influenced negatively, have also been listed in the book by Tummers (2018), who wrote about different dimensions of wellness, which can also be interpreted as well-being, namely physical, emotional, intellectual, spiritual, social and environmental, which get influenced by the experience of stress. These aspects seem therefore to be of importance when researching the problems students experience when facing stress. Regarding the time-management behavior of stressed students, the interviews provided the same findings as in different studies before. It showed that organizational behavior, keeping a good structure and planning, are important in order to reduce stress and that time management plays a crucial role in this (Gionta, 2009; Scott, 2018; Voltolina, 2017). Nevertheless, the interviews also showed that self-management behavior like making a schedule and to-do lists alone were not enough to not suffer from stress related problems and consequences in daily life. The setting of priorities of tasks and goals to manage the time effectively was still a problem. This goes along with the findings of Gionta (2009) and Voltolina (2017), who described that a good time management has

to fit the own needs and that a lot of stress arises because some actions and appointments are over- or underrated at first, and the priorities are not straight. Based on the findings, there seems therefore to be a need for personalized tools to help enhance the time-management behavior and the setting of priorities to lessen stress in the long run.

The second question "*Which needs and preferences do the patient partners have regarding the persuasive features and design in the chosen technology, to positively influence the stress-management behavior in students of the University of Twente?*" showed that although there have only been two patient partners, they agreed in many wishes and needs regarding the persuasive features and the design. Interestingly, they both agreed strongly, that they do not want any social supporting persuasive features in the prototype, because they see this information about their goals and daily tasks as very private. However, this finding is contrary to most of the designed eHealth interventions, which are mostly focused on incorporating some form of social support, to keep the user motivated by e.g. social competition or in form of support chats, to connect with others who suffer from the same condition or problem (Kreps, & Neuhauser, 2010; Vorderstrasse, Levinski, Melkus, & Johnson, 2016). Only a few studies, like the one from Lentferink et al. (2017), confirm that social elements are not always favored by the end-users and that they can have a negative attitude towards these. Nevertheless, the interview partners differed in their priorities regarding the features wanted in an application, with the one focusing more on the mood and positive feeling aspect, with features like a cute motivating animal. While the other on the usability, where the motivating feature should only be a funny phrase. Still, the differing priorities contributed positively to the design, because both aspects were taken into account in the design of the prototype which this way could be created matching different needs. With more

patient partners it would have become clearer, if there are other priorities and needs, students have regarding an application that should reduce stress and should be taken into account. To test this, a questionnaire about which persuasive and design features are favored could be used to reach more people of the focus group to obtain more validity in the features to be used in the design. In order to create a prototype that fits a high amount of the target group, the features mentioned most often in the questionnaires, could be then incorporated.

The third question "*How should the chosen technology be designed, taking into account the patient partners opinions, regarding persuasive features and behavioral change techniques to positively influence the stress-management behavior in students of the University of Twente*?" was answered with a possible design of the low-fidelity prototype which contained the wishes and needs of the patient partners as well as psychological theories to change behavior. Both patient partners gave detailed information about features they would or would not like to see in the prototype. This made the designing process of the low-fidelity prototype easier, because most elements and features have been mentioned. Regarding the different priorities of the two patient partners, it would also be possible to create two prototypes, one mainly functional and one with more mood enlightening elements, where the guiding character and colors of the application could be chosen. With only one prototype used, it was important to keep a balance between these two preferences. The compromise was therefore on the one hand to use a character, but not a too specific one and to use tasks that can take longer than a minute, on the other hand to leave out features like changing the color or choosing a character to keep it more focused on the important functions that help with the self-management. In general, this prototype should therefore meet the basic needs of the target group but could contain more features, depending on the needs and

wishes that a bigger group of interview partners would mention.

Lastly, the fourth Research question "*In how far is the created eHealth technology understandable and easy to use for students with stress problems from the University of Twente*?" was answered with the six usability tests. The eight tasks that were given to the testers were all easy to accomplish except of one. This demonstrated that the prototype was overall designed with a logical structure. Regarding the recommendations, every tester gave another feedback as to what features they are missing in the prototype. This strengthens the need for more interview partners in the second interview, to get a better overview of the wishes and needs of the target group. The recommendations showed that the design contains the most important elements but that there are still many different preferences for other features. Including more patient partners could on the one hand lead to more needs and preferences, which were possibly missed due to the small amount of interview partners, and on the other hand it could be possible to reach a higher consensus regarding more specific needs and preferences, e.g., entertaining or relaxing elements in the application. The more interview partners, the higher the chance to find wishes and needs that a high amount of the target group shares. Overall, the usability test was therefore useful to find out if the created design matches this basic needs and wishes of the target group. Many scientific articles describe the need of usability tests, to ensure that the created technology is designed in an understandable manner and that the user is actually satisfied with the design. The probability that a technology will be used in the long run when it is confusing for the user or the design is not appealing, is low, so it is important to test this (Crowther, Keller, & Waddoups, 2004; Jeng, 2005; Olsen, Procci, & Bowers, 2011). The designed usability test in this study showed that the created low-fidelity prototype was designed logically, which increases the

chance that, when accounting for the limitations, the eHealth application could actually be used by the target group to gain a behavioral change. Nevertheless, it did not demonstrate, if the goal management tasks are fitting and useful in the long run, it was more focused on the design. Another usability test should therefore focus on the content and if this is useful to lessen the feeling of stress in students.

Limitations and strengths

The strongest weakness of this study was the small number of interview partners used in the first two interviews. More interview partners could have given a clearer direction on which elements and features the prototype should focus on to be representable for a higher amount of the target group students with stress management problems. With two interview partners with different focus points in their needs and wishes, it is rather unclear where the consensus on the needs and wishes of this group is. Furthermore, the design should be performed more careful due to the fact that small faults in design can lead to high confusion by the users. Moreover, to test if the self-management behavior of the target group really can be improved by a prototype with goal management focus, follow-up studies should integrate a usability test specifically for the content of the created prototype and a longitudinal survey design could be used to test whether the feeling of stress decreases with the usage of a prototype over time.

However, this study also provided important insights. It confirms on a small sample that the actual problem, the high stress, can occur even though different time management techniques are used by people of the target group and that in order to make it effective, more personalized help is needed. Furthermore it was shown that although most eHealth approaches use social elements in their technology to motivate the user, this social support may not be useful in every

eHealth approach because some health or problem related issues are seen as too personal and intimate to be shared, which should be taken into account. Personal goals and daily tasks are seen as such personal and intimate topics. This finding would not have been found without the usage of a user-centered design. This design therefore helped to create a prototype that matches important needs in a sample of the target group. Furthermore, the user centered design and the usability test lead to the design of the prototype, which was mostly regarded as logical and can be a good base for further designs of prototypes within this field when considering the recommendations.

Conclusion

The idea to create a high-fidelity prototype, based on the given study and the recommendations, for the problem of stress experienced by students should stay a topic of interest. The societal trend is that more and more people study and the demands are not getting less. The effects of study related stress, the constant pressure and the risk for developing mental and physical problems due to the stress, were described in studies from the last decades till now and are also shown in the interviews in this study. There is a high usage of technology, especially by young people, which can be taken as an advantage to create eHealth technology to help reducing stress and in this way, prevent further health issues in a part of the future generation. Taking into account their needs and wishes offers the possibility to create eHealth technology that has an influence on their time and goal management behavior and to create content that can be personalized and therefore be useful to the targeted user group. The used “Right on target” intervention goal-management tasks match the need of the target group to effectively manage and prioritize their own goals and tasks to reduce the feeling of stress. Furthermore, the tasks

from this intervention used in this study were described as helpful in the usability test and seem therefore to be suited to be used in further eHealth approaches for students with stress problems. In order to offer the end-users more help and options, more of the tasks of the “Right on target” intervention could be used and translated into a prototype. Further research should be conducted in order to test in how far the time-management behavior can be improved over time by eHealth based on the “Right on target” intervention.

References

Abras, C., Maloney-Krichmar, D., & Preece, J. (2004). User-centered design. *Bainbridge, W. Encyclopedia of Human-Computer Interaction. Thousand Oaks: Sage Publications*, *37*(4), 445-456.

Alzahem, A. M., Van der Molen, H. T., Alaujan, A. H., & De Boer, B. J. (2014). Stress management in dental students: a systematic review. *Advances in medical education and practice*, *5*, 167.

Andrews, B., & Wilding, J. M. (2004). The relation of depression and anxiety to life-stress and achievement in students. *British journal of psychology*, *95*(4), 509-521.

Arends, R. Y., Bode, C., Taal, E., & Van de Laar, M. A. (2013). A goal management intervention for polyarthritis patients: rationale and design of a randomized controlled trial. *BMC musculoskeletal disorders, 14*(1), 239.

Bakker, K., Hasami, S., Klaver, A., Postema, M., Montanus, R., & De Weerd, B. (2017, July). Studenten en Stress Een onderzoek naar stress onder Groninger Studenten. Retrieved May 28, 2019, from http://groningerstudentenbond.nl/

Bayram, N., & Bilgel, N. (2008). The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Social psychiatry and psychiatric epidemiology, 43*(8), 667-672.

Beiter, R., Nash, R., McCrady, M., Rhoades, D., Linscomb, M., Clarahan, M., & Sammut, S. (2015). The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *Journal of affective disorders*, *173*, 90-96.

Butler, G. (1993). Definitions of stress. *Occasional paper (Royal College of General Practitioners)*, (61), 1.

Credé, M., & Kuncel, N. R. (2008). Study habits, skills, and attitudes: The third pillar supporting collegiate

academic performance. *Perspectives on psychological science*, *3*(6), 425-453.

Crowther, M. S., Keller, C. C., & Waddoups, G. L. (2004). Improving the quality and effectiveness of

computer-mediated instruction through usability evaluations. *British Journal of Educational Technology*, *35*(3), 289-303.

de Beurs, E., Van Dyck, R., Marquenie, L. A., Lange, A., & Blonk, R. W. (2001). De DASS: een

vragenlijst voor het meten van depressie, angst en stress. *Gedragstherapie, 34*(1), 35-54.

Gionta, D. (2009, December 10). Can being more organized be good for your health? Retrieved March 17, 2019, from https://www.psychologytoday.com/us/blog/occupational-hazards/200912/can-being-more-organized-be-good-your-health

Gould, W. R. (2017, August 25). Why you're scared to see the doctor (and how to get over it). Retrieved March 17, 2019, from https://www.nbcnews.com/better/health/real-reason-going-doctor-gives-you-anxiety-ncna795566

Hammen, C. (2005). Stress and depression. *Annu. Rev. Clin. Psychol.*, *1*, 293-319.

Heins, M., Fahey, S. N., & Leiden, L. I. (1984). Perceived stress in medical, law, and graduate

students. *Journal of Medical Education, 59*(3), 169-179.

Jeng, J. (2005). Usability assessment of academic digital libraries: effectiveness, efficiency, satisfaction,

and learnability. *Libri*, *55*(2-3), 96-121.

Keyes, C. L. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of*

health and social behavior, 207-222.

Kezer, M., Sevi, B., Cemalcilar, Z., & Baruh, L. (2016). Age differences in privacy attitudes, literacy and privacy management on Facebook. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *10*(1). trade-off. (n.d.). In *dictionary.cambridge.org.* Retrieved November 19, 2018 from https://dictionary.cambridge.org/dictionary/english/trade-off

Kreps, G. L., & Neuhauser, L. (2010). New directions in eHealth communication: opportunities and challenges. *Patient education and counseling*, *78*(3), 329-336.

Latham, G.P., & Locke, E.A. (1991). Self-regulation through goal setting. *Organizational Behavior and Human Decision Processes, 50*, 212-247.

Lentferink, A. J., Oldenhuis, H. K., de Groot, M., Polstra, L., Velthuijsen, H., & van Gemert-Pijnen, J. E. (2017). Key components in eHealth interventions combining self-tracking and persuasive eCoaching to promote a healthier lifestyle: a scoping review. *Journal of medical Internet research*, *19*(8), e277.

Lorig, K. R., & Holman, H. R. (2003). Self-management education: history, definition, outcomes, and mechanisms. *Annals of behavioral medicine*, *26*(1), 1-7.

Lund, H. G., Reider, B. D., Whiting, A. B., & Prichard, J. R. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *Journal of adolescent health*, *46*(2), 124-132.

Macan, T. H., Shahani, C., Dipboye, R. L., & Phillips, A. P. (1990). College students' time management: Correlations with academic performance and stress. *Journal of educational psychology*, *82*(4), 760.

Marx, U. (2016, December 30). Überforderung: Studenten unter Stress. Retrieved June 22, 2019, from https://www.faz.net/aktuell/beruf-chance/campus/studenten-sind-vom-stress-oft-ueberfordert-14588427.html

Misra, R., & McKean, M. (2000). College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *American journal of Health studies*, *16*(1), 41.

Newzoo. (2018, September). Top Countries/Markets by Smartphone Penetration & Users. Retrieved from https://newzoo.com/insights/rankings/top-50-countries-by-smartphone-penetration-and-users/

Oinas-Kukkonen, H., & Harjumaa, M. (2008, June). A systematic framework for designing and evaluating persuasive systems. In *International conference on persuasive technology* (pp. 164-176). Springer, Berlin, Heidelberg.

Olsen, T., Procci, K., & Bowers, C. (2011, July). Serious games usability testing: How to ensure proper usability, playability, and effectiveness. In *International Conference of Design, User Experience, and Usability* (pp. 625-634). Springer, Berlin, Heidelberg.

Onderwijs, M. V., & Wetenschap. (2018, September 17). Prognose aantal studenten wo. Retrieved March 17, 2019, from https://www.onderwijsincijfers.nl/kengetallen/wo/studenten-wo/prognoses-aantal-studenten-wo

Phinney, J. S., & Haas, K. (2003). The process of coping among ethnic minority first-generation college freshmen: A narrative approach. *The Journal Of Social Psychology, 143*(6), 707-726. doi:10.1080/00224540309600426

Qin, Z., Zhou, X., Pandey, N. R., Vecchiarelli, H. A., Stewart, C. A., Zhang, X., ... & Hill, M. N. (2015). Chronic stress induces anxiety via an amygdalar intracellular cascade that impairs endocannabinoid signaling. *Neuron*, *85*(6), 1319-1331.

Saipanish, R. (2003). Stress among medical students in a Thai medical school. *Medical teacher*, *25*(5), 502-506.

Scott, E. (2018, January 28). Secret Weapon Against Stress: Getting Organized! Retrieved March 17, 2019, from https://www.verywellmind.com/tips-on-getting-organized-3145158

Seligman, M. E. (2004). *Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment*. Simon and Schuster.

Tummers, N. E. (2018). *Stress management: A wellness approach*. Human Kinetics.

UniHealth.nd. 2017 University student wellbeing survey. Retrieved on 13 May 2019, from: https://unihealth.uk.com/reports/

Unterberg, S., & Spiegel Online. (2018, November 27). Statistik: Studentenrekord an deutschen Hochschulen - SPIEGEL ONLINE - Leben und Lernen. Retrieved March 17, 2019, from http://www.spiegel.de/lebenundlernen/uni/studenten-an-hochschulen-zahl-steigt-auf-2-8-million-neuer-rekord-a-1240584.html

van Gemert-Pijnen, J. E. W. C., Peters, O., & Ossebaard, H. C. (Eds.). (2013). *Improving eHealth*. Den Haag: Eleven international publishing.

van Veen, Y., Peeters, N.,Bohlmeijer, E., & Bode, C. (2018).*Stapsgewijze aanpak sterker in je kracht*.

Vorderstrasse, A., Lewinski, A., Melkus, G. D. E., & Johnson, C. (2016). Social support for diabetes self-management via eHealth interventions. *Current diabetes reports*, *16*(7), 56.

Voltolina, V. (2017, December 07). 3 Easy Tricks To Get Organized And Reduce Stress. Retrieved March 17, 2019, from https://www.huffpost.com/entry/organization-and-stress_n_5851704/amp

World Health Organization. (1946, June). Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. In *International Health Conference, New York* (pp. 19-22).

Wrosch, C., Scheier, M. F., Miller, G. E., Schulz, R., & Carver, C. S. (2003). Adaptive self-regulation of unattainable goals: Goal disengagement, goal reengagement, and subjective well-being. *Personality and Social Psychology Bulletin, 29*, 1494–1508. doi: 10.1177/0146167203256921.

Zajacova, A., Lynch, S.M., & Espenshade, T.J. (2005). Self-Efficacy, Stress, and Academic Success in College. *Research in Higher Education, 46(*6), 677-706 from: https://link.springer.com/article/10.1007%2Fs11162-004-4139-z?LI=true

Appendix A – Ethics approval

APPROVED BMS EC RESEARCH PROJECT REQUEST

Dear researcher,

This is a notification from the BMS Ethics Committee concerning the web application form for the ethical review of research projects.

Requestnr. :	190360
Title :	Designing an eHealth intervention based on the strength based approach "Raise your strengths"
Date of application :	2019-03-21
Researcher :	Szajda, N.T.
Supervisor :	Peeters, N.J.
Commission :	Klooster, P.M. ten
Usage of SONA :	N

Your research has been approved by the Ethics Committee.

The ethical committee has assessed the ethical aspects of your research project. On the basis of the information you provided, the committee does not have any ethical concerns regarding this research project.

It is your responsibility to ensure that the research is carried out in line with the information provided in the application you submitted for ethical review. If you make changes to the proposal that affect the approach to research on humans, you must resubmit the changed project or grant agreement to the ethical committee with these changes highlighted.

Moreover, novel ethical issues may emerge while carrying out your research. It is important that you re-consider and discuss the ethical aspects and implications of your research regularly, and that you proceed as a responsible scientist.

Finally, your research is subject to regulations such as the EU General Data Protection Regulation (GDPR), the Code of Conduct for the use of personal

Moreover, novel ethical issues may emerge while carrying out your research. It is important that you re-consider and discuss the ethical aspects and implications of your research regularly, and that you proceed as a responsible scientist.

Finally, your research is subject to regulations such as the EU General Data Protection Regulation (GDPR), the Code of Conduct for the use of personal data in Scientific Research by VSNU (the Association of Universities in the Netherlands), further codes of conduct that are applicable in your field, and the obligation to report a security incident (data breach or otherwise) at the UT.

-

9. CONCLUSION

Status: Approved by commission

The ethical committee has assessed the ethical aspects of your research project. On the basis of the information you provided, the committee does not have any ethical concerns regarding this research project. It is your responsibility to ensure that the research is carried out in line with the information provided in the application you submitted for ethical review. If you make changes to the proposal that affect the approach to research on humans, you must resubmit the changed project or grant agreement to the ethical committee with these changes highlighted.

Moreover, novel ethical issues may emerge while carrying out your research. It is important that you re-consider and discuss the ethical aspects and implications of your research regularly, and that you proceed as a responsible scientist.

Finally, your research is subject to regulations such as the EU General Data Protection Regulation (GDPR), the Code of Conduct for the use of personal data in Scientific Research by VSNU (the Association of Universities in the Netherlands), further codes of conduct that are applicable in your field, and the obligation to report a security incident (data breach or otherwise) at the UT.

2019-03-25 15:36:58 6/6

Appendix B - General Information

In the context of my Bachelor Thesis, in the field of Positive psychology, I am trying to develop a low fidelity prototype of an technology for students with stress management problems to help them dealing with those. I will do this based on a stepped care approach called “Raise your strengths”, from which certain worksheets from the “Right on targert” intervention will be used later in the eHealth technology prototype. This existing stepped care approach was made to enhance self-management behavior in chronically ill patients. To do so, they created sessions for general practitioners, mental health nurses and patients, in which the patients could fill in worksheets with tasks and questions about their strengths and their goals. With these tasks, the patients were motivated to find out more about their strengths, how they can be used to reach desired goals and also how to prioritize the own goals for a better well-being. The goal oriented part of this approach, the “Right on target” intervention is what I will use to incorporate in the eHealth technology to enhance stress management behavior. The chosen worksheets will be shown to you before the second interview.

To create an eHealth prototype that matches your needs, I would like to learn more about the stress related problems you are experiencing, how they affect your daily life, ideas on how this could be improved and, of course, also how you use technology in general and in this context. The interviews are designed to better serve the needs and requirements of the users in the intervention so that the product is really appealing and helpful.

I would like to have 3 interviews with you, each of them will be about 1 hour long. In the

first one I want to know more about you and your daily life situation regarding stress. I am also interested in your self-management behavior and what you tried so far to cope with the problem. Also if you already used technology to help you dealing with it.

In the second one we will together try to figure out which health technology you think could be most useful for you and what it should contain to be really helpful and effective. To do so, I will show you worksheets of the"Right on target" intervention, in which a lot of tasks are given to better structure the own goals.

The last interview will be a pilot test, where we will try to find out, if the created low fidelity prototype suits your needs and matches your expectations. Before this test I will give you further information and instruction how it will be done. Remember that this test is not done to test you, but in how far the prototype is useful. There is nothing you can do wrong here, it is only about your opinion.

This means that I am really interested in your experience and your needs. Like mentioned, there are no right or wrong answers, you are the expert on this topic and your experience and needs count. With your permission, I will record the interviews to transcribe them afterwards and work with them in my thesis. Your data will, of course, remain anonymous and the interview transcript and used quotations also. You're always free to stop or cancel the interview.

At this point I would like to know if you have to the previously mentioned information questions. So if you would agree to participate, I would now ask you to sign the agreement. Then I would like to start with some general questions

Appendix C – Informed consent

Informed Consent for standard research

'I hereby declare that I have been informed in a manner which is clear to me about the nature and method of the research as described in the aforementioned information paper. My questions have been answered to my satisfaction. I agree of my own free will to participate in this research. I reserve the right to withdraw this consent without the need to give any reason and I am aware that I may withdraw from the interview at any time. I agree that the interviews will be recorded by the researcher on a technical device, secured by a pin code and only used by the researcher for the report. My personal information will be made completely anonymous in the report. My personal data will not be disclosed to third parties without my express permission. If I request further information about the research, now or in the future, I may contact Nicole Szajda by email, n.t.szajda@student.utwente.nl.

Signed in duplicate:

…… ……

Name subject Signature

I have provided explanatory notes about the research. I declare myself willing to answer to the best of my ability any questions which may still arise about the research.'

…… ……

Nicole Szajda

Appendix D – Interview schemes

First interview questions:

General:

Who are you and how are you?

How old are you?

Where are you from (country may be enough)?

Since when are you a student?

What are you studying?

How would you describe your study? (in general terms, not the specific subject)

Recognition of the disease and symptoms

In how far do you experience stress due to your study?

What does stress mean to you? How would you define it?

Since when do you experience problems because of stress?

What problems did you experience because of your study?

Did you ever consult a doctor or other medical professionals because of these problems?

Why/Why not?

Impairments in daily life

In how far did you experience impairment in your study due to the stress?

Did/Do you experience any impairments in your social life because of the stress?

If yes what kind of impairments do/did you have experienced in your social life?

Did these stress problems also impair other parts of your daily life?

If yes, in how fair did they impair you?

Self-management

How do you manage the stress problems if they come up?

Are there some strategies that you use in your daily life?

Do they work for you?

Are there strategies that you tried but which did not work?

Why do you think they did not suit you?

What problems do you experience with your self-management?

Which behaviour improves your current situation?

Is there anything which makes it easier for you to cope with the problems?

Other people

How do other people react to your stress problems?

In how far do you feel others understand you problems?

Did you seek help from others? (e.g. medical professionals, friends, family)

Second interview scheme:

Showing beforehand the goal management oriented worksheets and the tables of persuasive features, explaining them.

Technology

- Do you use technical devices? If yes, which ones?
- How often do you use those devices? (every day, a few times a week, once a week, once a month, less than once a month)

  (How much time do you spend with technical devices per day?)
- Are there technical devices (if needed: e.g. websites, apps, other technologies) which helped you to deal with stress ?
- If yes, which ones?

  → How did they help you?

  → Are you still using them?

  → Did they help you with your problems in the long run? Why/why not?
- If no, could you think of one which could help you in your daily life?

  → What kind of technology would you prefer regarding this eHealth intervention?
- What are the most problematic behaviours that you have?/ Referring to the problems mentioned

  → Do you have an idea how a technology could solve those problems?

  → I brought a table with examples of persuasive features, which features do you like to see on a eHealth platform to make it more usable for you?

  → Which features do you want to avoid on the platform?

- Are there any other elements you can think of that you want to include?
- Are there any other elements you can think of that you want to exclude?
- You have seen the goal focussed worksheets, do you have any idea about how you would like to see them in a eHealth platform?

Third interview scheme:

Beforehand:

There are 2 buttons which have no further screen, the “Reminders” and the “Language” buttons. Furthermore, there is no option to type something in. When performing a task, please just tell me where you would click to type something in. You can only click through the app and not swipe or scroll. Please think aloud while doing the tasks. Do you have further questions?

Then I would like to start with some easy tasks.

The first one would be to please type in your name.

Great! The second one is to please select a password.

Good, the third easy one is to please skip the tutorial.

Now the tasks will be a little bit more difficult, I like you to please take a look at your long-term goals.

Good job! Go back to the home screen please.

The next task is to please watch the tutorial again.

Then I like you to fill in two goal pyramids in the goal pyramids task.

Good, go back to the home screen please.

Now please enter “possible actions” for threatened main goals task.

Great! Go back to the home screen please.

And last I like you to select all “To-do list” tasks as done.

Thank you!

Now I like to know if you have some recommendations regarding the app?

(If no, is there something missing? Are there things you did like/did not like?)

(If no, imagine you are really stressed out, would this app be useful to you as it is?)

Thank you very much for your participation in this study!

Appendix E - Signed informed consents

Informed Consent for standard research

'I hereby declare that I have been informed in a manner which is clear to me about the nature and method of the research as described in the aforementioned information paper. My questions have been answered to my satisfaction. I agree of my own free will to participate in this research. I reserve the right to withdraw this consent without the need to give any reason and I am aware that I may withdraw from the interview at any time. I agree that the interviews will be recorded by the researcher on a technical device, secured by a pin code and only used by the researcher for the report. My personal information will be made completely anonymous in the report. My personal data will not be disclosed to third parties without my express permission. If I request further information about the research, now or in the future, I may contact Nicole Szajda by email, n.t.szajda@student.utwente.nl.

Signed in duplicate:

Name subject Signature

I have provided explanatory notes about the research. I declare myself willing to answer to the best of my ability any questions which may still arise about the research.'

Informed Consent for standard research

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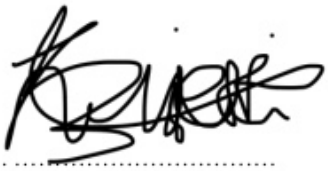
Signed in duplicate:



....

Name subject Signature

I have provided explanatory notes about the research. I declare myself willing to answer to the best of my ability any questions which may still arise about the research.'

Informed Consent for standard research

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Signed in duplicate:

....., 04.04.19

Name subject Signature

Informed Consent for standard research

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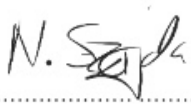
Signed in duplicate:

..... 27.03.19, Enschede

Name subject Signature



Nicole Szajda

Appendix F – Persuasive features

Persuasive Features (PSD model, Oinas-Kukkonen & Harjumaa, 2009)

Primary Task Support		
Principle	**Example requirement**	**Visible in Down your Drink** **(Yes/no)**
Reduction A system that reduces complex behaviour into simple tasks helps users perform the target behaviour, and may increase the benefit/cost ratio of behaviour.	System should reduce effort that users expend with regard to performing their target behaviour.	
Tunneling Using the system to guide users through a process of experience provides opportunities to persuade along the way.	System should guide users in the attitude change process by providing means for action that brings them closer to the target behaviour.	
Tailoring Information provided by the system will be more persuasive if it is tailored to the potential needs, interests, personality, usage context, or other factors relevant to a user group.	System should provide tailored information for its user groups.	
Personalization A system that offers personalized content or services has a greater capability for persuasion.	System should offer personalized content and services for its users.	
Self-monitoring A system that keeps track of one´s own performance or status supports the user in achieving goals.	System should provide means for users to track their performance or status.	
Simulation Systems that provide simulations can persuade by enabling users to observe immediately the link between cause and effect.	System should provide means for observing the link between the cause and effect with regard to users´ behaviour.	
Rehearsal A system providing means with which to rehearse a behaviour can enable people to	System should provide means for rehearsing a target behaviour.	

change their attitudes or behaviour in the real world.		

Dialogue Support		
Principle	**Example requirement**	**Visible in Down your Drink** **(Yes/no)**
Praise By offering praise, a system can make users more open to persuasion.	System should use praise via words, images, symbols, or sounds as a way to provide user feedback information based on his/her behaviours.	
Rewards Systems that reward target behaviours may have great persuasive powers.	System should provide virtual rewards for users in order to give credit for performing the target behaviour.	
Reminders If a system reminds users of their target behaviour, the users will more likely achieve their goals.	System should remind users of their target behaviour during the use of the system.	
Suggestion Systems offering fitting suggestions will have greater persuasive powers.	System should suggest that users carry out behaviours during the system use process.	
Similarity People are more readily persuaded through systems that remind them of themselves in some meaningful way.	System should imitate its users in some specific way.	
Liking A system that is visually attractive for its users is likely to be more persuasive.	System should have a look and feel that appeals to its user.	
Social role If a system adopts a social role, users will more likely use it for persuasive purposes.	System should adopt a social role.	

System Credibility Support		
Principle	**Example requirement**	**Visible in Down your Drink** **(Yes/no)**
Trustworthiness A system that is viewed as trustworthy will have increased powers of persuasion.	System should provide information that us truthful, fair and unbiased.	
Expertise A system that is viewed as incorporating expertise will have increased powers of persuasion.	System should provide information showing knowledge, experience and competence.	
Surface credibility People make initial assessments of the system credibility based on a firsthand inspection.	System should have competent look and feel.	
Real-world feel A system that highlights people or organization behind its content or services will have more credibility.	System should provide information of the organization and/or actual people behind its content and services.	
Authority A system that leverages roles of authority will have enhanced powers of persuasion.	System should refer to people in the role of authority.	
Third-party endorsements Third-party endorsements, especially from well-known and respected sources, boost perceptions on system credibility.	System should provide Endorsements from respected sources.	
Verifiability Credibility perceptions will be enhanced if a system makes it easy to verify the accuracy of site content via outside sources.	System should provide means to verify the accuracy of site content via outside sources.	

Social Support		
Principle	**Example requirement**	**Visible in Down your Drink** **(Yes/no)**
Social learning A person will be more motivated to perform a target. behavior if (s)he can use a system to observe others performing the behavior.	System should provide means to observe other users. who are performing their target behaviors and to see the outcomes of their behavior.	
Social comparison System users will have a greater motivation to perform the target behavior if they can compare their performance with the performance of others.	System should provide means for comparing performance with the performance of other users.	
Normative influence A system can leverage normative influence or peer pressure to increase the likelihood that a person will adopt a target behavior.	System should provide means for gathering together people who have the same goal and make them feel norms.	
Social facilitation System users are more likely to perform target behavior if they discern via the system that others are performing the behavior along with them.	System should provide means for discerning other users who are performing the behavior.	
Cooperation A system can motivate users to adopt a target attitude or	System should provide means for co-operation.	

/ /

behavior by leveraging human beings' natural drive to co-operate.		
Competition A system can motivate users to adopt a target attitude or behavior by leveraging human beings' natural drive to compete.	System should provide means for competing with other users.	

Appendix G - Chosen worksheets “Right on target” intervention

Exercise 1.D. Taking stock

Activities that you do during your daily life can give you a lot of energy. Performing such activities leaves you with a sense of satisfaction and countentment. However, there might also be activities that may cost more energy and effort to do than they earn. In a matter of speaking the balance or scales will tip to the wrong side. The next exercise is intended to discover the balance of the activities that you think are important.

Explanation. Write down your important activities in the first column.

Next, in the second column, use minuses to indicate how much effort it costs you. One minus (-) means *not a lot of effort*, two minuses (--) means *rather a lot of effort* and three minuses (---) means *a lot of effort*.

And finally, in the third column, write down how much satisfaction you get from doing them. Here one plus (+) means *not a lot of satisfaction*, two pluses (++) means *rather a lot of satisfaction* and three pluses (+++) means *a lot of satisfaction*.

Important activity	Effort - / -- / ---	Satisfaction + / ++ / +++	Main goal or goals *in exercise 2.C* **Don't fill in yet!**
Example: Walking the dog four times a day	--	+++	1. health 2. social connections

Check the balance between the effort these activities cost you and satisfaction they give you. Below you can write down what catches your eye.

Exercise 2.A. Goal pyramid

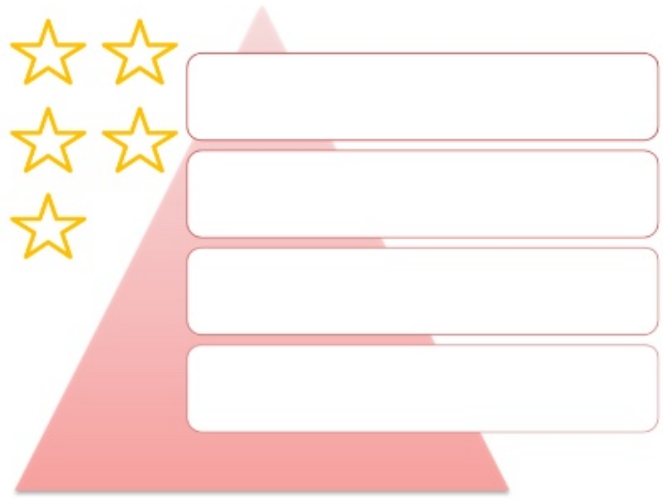
In exercises 1.B, 1,C and 1.D you have written down activities that are important to you. With the help of the goal pyramid we will take a closer look at several activities. This way you can make it more clear for yourself why these activities are important to you.

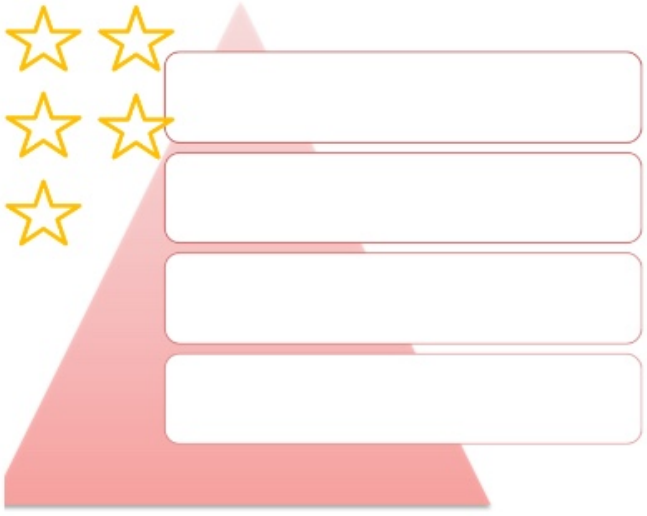
Explanation. Select an activity that is important to you and that is being threatened by your arthritis. Write this down in the lowest layer of a pyramid on the worksheet.

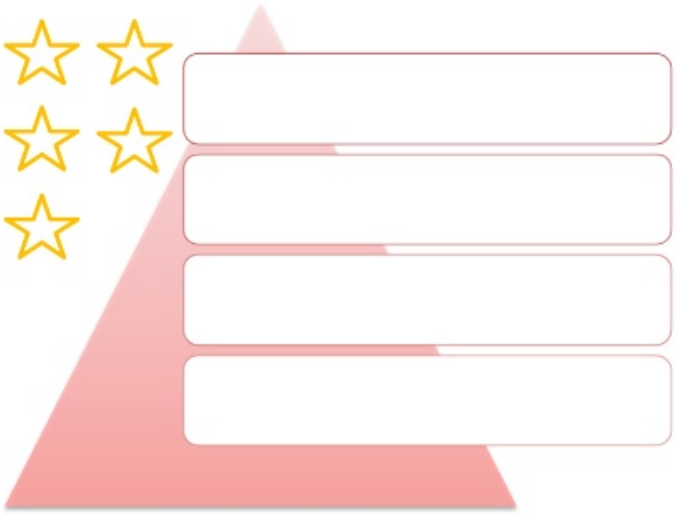
Then consider whether you can write down a 'higher' goal above it. You can ask yourself the following questions to achieve this: Why do you consider this important? What is it that you like about it?

Not all layers of the pyramid have to always be filled in, just try and see how far you can get. Note down 1 activity per pyramid. Try to fill in more pyramids for activities that are important to you.

You will find an example below:







Exercise 2.B Importance of the main goals

You have just figured out the main goals for your important activities. Now, with every pyramid, indicate how important the main goal is for you with the help of stars. You can already see the empty stars next to the pyramid. Compare all the main goals you wrote down in the top of the pyramid and consider how important these main goals are to you.

With each pyramid, use the stars to indicate how important that main goal is to you. Colour in the amount of stars per pyramid. 1 star means 'not really important' and 5 stars means 'the most important goal for me'. There doesn't have to be any specific order, they can also be equally important, for example.

Exercise 2.C. Threatened main goals

Look back on exercise 1.D: the scales Take stock, here you wrote down how much effort certain activities cost and how much satisfaction you get from doing them. For several activities you have figured out the main goals with the help of the pyramids. Now write these down in the final column of the balance sheet.

Exercise 2.D. Select an important activity

Which activity is important to you and is harder to achieve because of your rheumatism? What is sometimes or always difficult for you? Select one of these activities as the one you would like to work on in the coming weeks. Consider what you would like to improve, but with which you might still require some help or support to achieve it. Don't just consider ways to be able to do an activity better or easier: an activity that you may have to give up (soon) is also suitable to work on during this course.

- If you're not completely sure whether you have selected a suitable activity, write down multiple and choose the best possibility during our third meeting. In that case, complete the questions below for all chosen activities.

I would like to work on the following threatened activity:

_____

Describe the problem or problems that you encounter during this activity. In this activity I encounter the following problems:

_____
_____
_____
_____
_____

Write down the main goal that you have chosen for this activity by means of the pyramid as well. If you have not yet completed a pyramid for this activity, do so now. The main goal of this activity is:

_____

Next, write down several different possibilities or actions that could help you to solve the problems of the threatened activity. These do not have to be any actions that you actually want to take, just write down everything that comes to mind.

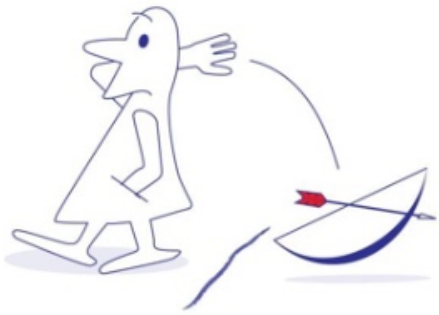
Several ways to diminish or solve the problems with the activity are:

_____
_____
_____
_____
_____

Exercise 3.A. Actions for a threatened activity

Below are pictured 4 figures, and each figure represents a different strategy. Which figure or figures best matches your plans? What strategy do these figures represent?

Write down all the actions you have already thought of next to the figure that best matches them. There are probably still some figures left that have nothing written next to them. Try to think of at least 1 action per figure for your threatened activity. These actions do not necessarily have to be realistic or feasible. Each figure has to have at least 1 action written next to them.



Appendix H – Extended version Table 2

Table 2

Coding scheme - Difficulties in stress situations and Self-management behavior

Category	Code	Frequency	Example quote
Difficulties in stressful situations	Stressful periods	6	most stressful period was in my second year (R1)
			in December I have to work 60 hrs per week. So, it's more than full time and after that I have to study for exam (R2)
			like in the winter months that it's mostly really stressful because that is like for me the depression time and everything is dark you don't have a lot of stuff that makes a good mood. (R1)
	Difficulties with Health	16	when I ended this module I actually got mononucleosis so I was ill for 4 weeks and I think, at least that's my thought, I think this was basically because I had one and a half months of pure stress and panic and not wanting to go to lectures and everything and not wanting to get to work with these people, so, I get bodily symptoms from stress. (R1)
			because of a lot of stress my cortisol and prolactin changed and my body is the whole time fight fight fight fight like this. And this over years and years and that's the reason that I have problems with my thyroid (R2)
			I get like sometimes really nervous and just generally feel like really tense all the time and just feel very irritated and suddenly angry, you know like, just emotional sometimes (R1)

Table 2 continued

Category	Code	Frequency	Example quote
			not being able to relax. (R1)
			if I am really stressed my skin starts to itch (R1)
	Difficulties in daily life	6	You have to work, you have to study, you have to do homework, you have to care of your child. You have to care for your dogs. You have to care for your family. And I am like I don't know I want to care for myself. One hour a day but there is not time (R2)
			moving out from home, being on your own, having to be an adult (R1)
	Social difficulties	11	I couldn't maintain all the social relations I had before my study because there was just so much work and so much stress (R1)
			while the other students meet up and enjoy their evening or nights by party or doing stuff, I was always working. (R2)
			the people are getting mad, you never have time, you are always working (R2)
			at some point I just didn't talk with my family about the problems because when I did I most times felt worse afterwards because I had the feeling that I have to defend myself and that I have to justify it and I think it's not worth it. (R1)

Table 2 continued

Category	Code	Frequency	Example quote
	Study related difficulties	31	I had to cut back on the quality of my study because I was just not able to give my all (R1)
			It is pretty exhausting at times, and challenging. (R1)
			It is a highly stressful study there are so many high demands (R1)
			a lot of deadlines in really short amount of times (R1)
			but its in two languages - Dutch and English and I am from Germany. And I don't live there and I have to get up very … early up in the morning (R2)
			Like, it's like a cycle. If I want to study, I have to work. If I don't work, I cannot study (R2)
			I passed but I could pass with better with better grades (R2)
Self-management behavior	Current self-management	35	I know that I'm really stressed but I don't have time to think about that now, if there is a period that is a little less work, than I can deal with that (R1)

Table 2 continued

Category	Code	Frequency	Example quote
			my parents give incredible amounts of energy and a positive mind. My parents are always there. They always try to look at the positive side. They know that there are also negativities in life but it's a part of life. But it don't.. it is not the main part of your life… Keep positive. It's really lovely. I like it. (R2)
			I have to organize myself a lot and I have to really keep to a schedule (R1)
			I think I just tried to better manage my studying, e.g., that I reviewed my study techniques (R1)
			now I am doing a bullet journal when I started working last year (R1)
			I do a kind of mindfulness exercise. Its like three good things. Its like … Drinking coffee, and putting away mobile phones and stuff like this and concentrate on nature. (R2)
			Your time is limited use it carefully. That's a strategy I use …I plan a lot. I have a good structure. Daily structure (R2)
			Sometimes I tell myself that it is shitty situation but it's now that way and I can't change anything on the situation, focus on the result of it - something positive (R2)

Table 2 continued

Category	Code	Frequency	Example quote
			But I think it's really important in coping with the stress to have that after a planned time of learning, e.g. from 9 to 3, that afterwards you are really done and don't study anymore and have time for your friends. (R1)
			So, everyone does one part and not one person everything. We support each other. (R2)
	Problems with self-management	19	I wanted to give more but I was just not able to do it, because otherwise I would maybe have failed another course or something like this and I think you really have to prioritize what's more important (R1)
			there was so much time that I just didn't realize (R1)
			I need more time. That's a problem. I need more sleep. More hours a day and at nights (R2)
			if I have a vision in my head of what I want to do and I don't get it done and I have to cut on stuff I feel like, it feels like a failure to me, because I actually wanted to do it but I just couldn't (R1)
			It's like you want to relax and to chill and to enjoy your time, your first free time after three months and then you get messages like oh I am not so important. You have time for this friend but not for me. That is very stressy and fucked up and you have to manage it somehow. (R2)
			And I am like I don't know I want to care for myself. One hour a day but there is not time. So I don't really have me time (R2)

**R = Respondent*

Appendix I – Extended version Table 3

Table 3

Coding scheme - Needs and preferences for features from the patient partners

Category	Code	Number of codes	Citation
Technology	Technology prefered for this eHealth approach	4	Yes, definitely an app I can use on my phone all the time. I don't have the time to use something fancy like virtual reality and I don't have the resources to use it and my smartphone, it is always by my side so this would be the most handiest for me. (R1)
			I think the best decision is … to have an app. Because sometimes it's like I have to …put up and stay up to put my laptop and … Ok two minutes three minutes and it's more like .. Extra work I don't like glasses or some stuff .. put it on my head… So and… I think this generation is like .. everyone has a mobile phone… everyone has a smartphone… Yahh it's…easier.. So I want to use something that's easy to use and … I can decide by myself the time maybe morning, evening, or in my break (R2)
Persuasive features to include	Reminders	7	I think the reminder possibility should be, or the whole app should be that you can adjust it to your needs, e.g., to shut off the reminder if you don't need it. Sometimes I find reminders necessary but I like to have the freedom to choose whether I want it or not. (R1)
			Maybe that you even can at the end of a month or a week that you get like a end result like wow this week you fulfilled so many goals and I just want to give you a quick reminder that these are your long term goals, so mainly that you can really see like a process how far you've came. (R1)
			Maybe Praise and Reminders (R2)

Table 3 continued

Category	Code	Number of codes	Citation
	Praise	6	I always like the praise you get when you achieved something and there is like a little mascot from the app (R1)
			when you did something or achieved a task it comes up and says “Oh my god congratulations you did so good, you finished the task and now you have only this and that left” and then maybe something like a funny phrase. (R1)
			You put it in a to do list and if you have achieved more than the half of your to do list in a day, then you would get a clap or Yeah great job. In words or the sound of a clap (R2)
	Rewards	3	rewards or something like this, I think maybe when you are rewarded for something you do or that you were supposed to do, I think that would be really good (R1)
			Maybe you can put on funny animal videos or clips.I want it to reduce my stress. So it should focusing reducing my stress. (R2)
	Expertise	4	I mean it would be good to see that it is an app from a university, I think that always adds to it, that it is scientifically researched. (R1)
			That the app is done by experts and not by… That It’s not like a hobby of someone but like some experts behind it. Yeah. I need experts for everything. (R2)
	Personalization	3	I think there are goals you have in the longer run but there are also goals you have like for a week or for a specific period and they can change so it shouldn’t be like all is fixed (R1)
			maybe there is something I did not think of before as it is often in your study that you e.g. have to prioritize something else or something different so I think the options have to be flexible. So easy to adjust to the situation. (R1)

Table 3 continued

Category	Code	Number of codes	Citation
			Reduction, Personalization. Stimulation. … Maybe Praise and Reminders (R2)
	Liking	1	Liking, the system should be visually attractive for me. (R2)
	Tailoring	1	Yes, reminders would be one thing, and tailoring and maybe also rewards or something like this (R1)
	Reduction	1	Reduction, Personalization. Stimulation. … Maybe Praise and Reminders. (R2)
	Self-monitoring	1	And I think self-monitoring would be useful (R1)
	Similarity	1	I think it always adds a really nice touch if you see that it was made by students because I feel like and I'm a student myself and I can better identify with them and you feel like it is more and I always have the feeling that if it is made by students it is not about money making but that they gave their all to make this app because they had a reason, like you because their wrote their bachelor thesis about it or something like that, and I think it always gives you the feeling that the person really cared about the consumer (R1)
Persuasive features to exclude	Social support	5	I wouldn't want something like social comparison or competition or anything because that is more stressing and I feel like I'm not the person who always wants to share how far I have come because I don't want to compare myself or how fast I am working on something or compared to someone else, because I think it is much more stressing (R1)

Table 3 continued

Category	Code	Number of codes	Citation
			I don't like comparing personal things. It's for myself and for my friends and its there stuff. Maybe they can.. If I want to tell them something I will tell but not by using an app. (R2)
			It's on my phone, my personal phone, I want to have it for myself and not with others. For social stuff you have to go outside. (R2)
	Use the app Reminders	1	Especially I don't want any "use the app" reminders because that would be like "Hello I'm still on your phone, you need to use me" and I think this is really annoying because than I will be stressed again because this would add another element where I would think like shi*t, I still have to use the app and the app should actually help me to feel less stressed so please don't put that in the prototype. (R1)
Design	Colours & decoration	5	not a lot of decorations, just simple and nice to look at it, like I said muted colours (R1)
			Minimalistic is a good term… Because too much colors and attention of biases put stuff like this. And if the app is good and the qualitive part is high you don't need much extras. I think stuff that has a lot of extra functions… A little bit to disguise that it is totally shit. (R2)
	Introduction/ Tutorial	4	Like maybe a home screen where you can click on a task you want to do or after a tutorial, but so that you can choose (R1)

Table 3 continued

Category	Code	Number of codes	Citation
			To be able to skip it and to rewatch it and it has to be short and simple. And keep it very very short and simple because people who are using application want assistance and not extra work. So no video.It should reduce your stress, it should not you put more .. higher level of stress. I don't know how to use this. (R2)
	Overview	3	Like maybe a home screen where you can click on a task you want to do or after a tutorial, but so that you can choose and you're not overwhelmed with the things that are coming up and I think it is always nice to have a clear overview with goals (R1)
			I think that is the most important thing about a goal / organization management app because if you are stressed your life is basically a mess so you need to have some structure and if the app is like filled with decoration and bling and something pops up there and there then it's not helpful because you have to have something that is clear, which gives you overview, this is what you should concentrate on, this is what you should focus on, if you want you can adjust this but that is the main thing you have to do , something like that. (R1)
	Usability	3	be easy to use (R1)
			I don't like complicated apps. First you have to download them, then you have to install options, then you have to fill in a lot of stuff and … Yahh. Maybe you use them for one week, and then put it away because you have to spent too much time on it. It must easy to use. (R2)
	Type of questions	3	They must not be easy they must be time limited. one minute per answer. Something like this Not causing more stress (R2)

Table 3 continued

Category	Code	Number of codes	Citation
	Atmosphere	1	It should really be a nice character who relaxes the atmosphere a little bit, who makes it all a bit more relaxed and calm so that it is not that serious. I don't like super serious apps that are like "We're gonna work on your problem", but something that lightens up the mood. (R1)
	Availability	1	It has to be available all the time … that's important, too. I don't like time limited apps. So if you don't put in this question, it will be away. Yeah. It's more like controlling. And I like to control more myself. I want to fill in the question the time everyday that I decide to fill it in. (R2)
	Brightness	1	because you have to look at it for a longer time to use it so it shouldn't be difficult to look at for the eye. (R1)
Other features additional to worksheets	Background information	3	But what I personally like I have this one app where you can click like on an info button so that you get some background information, where the theory is coming from, why it is helpful to use (R1)
	Calendar	2	some sort of calendar app or reminders to take breaks (R1)
			It's like using an agenda. So I can write everything down. (R2)
	To-do list	2	Maybe like a to do list where you can check what you've did so that at the end it can tell you like hey you reached 8 goals or something. (R1)
			The most important things and to put and use a to do list. So you can see what you have done and what you have achieved. (R2)

**R = Respondent*