Possibilities Of Technology To Decrease Stress In Students At The University Of Twente

Master thesis

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Abstract

Introduction. Reports of stress in students have increased in the past years. A possible way of decreasing student stress could be the development of a technological intervention, as this allows for larger scale provision of counselling and fits students as a target group.

Method. Several sub-studies were conducted to determine points of improvement in the current counselling process that the University of Twente offers for its students - the main target group and key stakeholders -, their needs, and the main features a possible technology should include. The used methods were desk research, a survey, focus groups and two interview studies, in which students as well as counselling staff were included.

Results. Outcomes show that factors like fear of missing out or making mistakes play a role in the onset of students stress. Furthermore, international students specifically are more vulnerable to feeling stressed, due to circumstances like the unfamiliar environment and financial pressure. Stakeholders were open to the idea of a new technological intervention. Values were determined based on the stakeholders' preferences.

Conclusion. A technological intervention should be developed to improve the counselling provision for university students. This technology should include information on various topics and provide students with tools to help them decrease their stress level, as well as give them the opportunity to relate to fellow students through the technology.

Introduction

In the Netherlands, the pressure on students, and with it the occurrence of stress and burnout in students, seems to have increased in the last years (NOS, 2018; Van Dinther, 2018). Approximately a quarter of all students show some symptoms of a burnout (Dopmeijer, 2017), which is as much or even more than the percentage in the general population (CBS, 2018; Vandereycken, 2012). Similar results have been found in other countries within and outside of Europe (dos Santos Boni et al., 2018; Grützmacher, 2018; Salmela-Aro & Read, 2017; Wolf & Rosenstock, 2017). A recent multinational study on student mental health mentions the possible benefits of a technological intervention to improve prevention and treatment of stress-related disorder in students (Auerbach et al., 2018).

Stress is commonly defined as the fit between a person and the environment, where a good fit means little or no stress and a bad fit results in higher stress levels (Lazarus & Launier, 1978). However, stress does not always have to be harmful. The term ‘eustress’ is used for stress that has a beneficial effect, while negative stress is also referred to as ‘distress’ (Ogden, 2012). The right perception or mindset with regards to stress is very important for the impact that stress can have.

Consequences of (prolonged) stress

A prolonged period of negative stress is defined as a burnout (Vandereycken, Hoogduin, & Emmelkamp, 2012). Students who suffer from a burnout were found to show less engagement, a positive, dedicated and fulfilling state of mind (Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002). In some studies engagement is even defined as the opposite of burnout (Schaufeli, Martinez, et al., 2002; Schaufeli, Salanova, González-Romá, & Bakker, 2002). Engagement in turn has been found to relate positively to academic achievement. Furthermore, stress and burnout, independently of what the stressor looks like, have negative effects on learning and can reduce academic achievements (Lin & Huang, 2014; Yang, 2004).

Next to the previously mentioned link between stress and burnout, research on student stress often includes the concepts of depression and anxiety (Bayram & Bilgel, 2008; Beiter et al., 2015; Dahlin, Joneborg, & Runeson, 2005; Mahmoud, Staten, Hall, & Lennie, 2012). Similar to stress and burnout, depression and anxiety were also related to lower academic achievement (Deroma, Leach, & Leverett, 2009; Taylor, Ruhl, & Park, 2019).

Consequently, once a student has reached a state of too much stress or any related disorder, this in turn affects how they perform in their classes and can cause new stressors to arise. Therefore, it is important to prevent the onset of stress in students and to treat students that already suffer from stress or related disorders, by helping them deal with stressors that they are facing (Bayram & Bilgel, 2008).

Causes of stress

Vandereycken et al. (2012) make a distinction between different situations that can evoke stress or a stress-related disorder. Firstly, they name a cumulation of minor events in everyday life as a possible reason for such a disorder, if not enough coping capacity is available. Next to this, a major life event (e.g. death of a family member, termination of employment) can also trigger a stress related disorder and result in symptoms like fatigue, physical pain or feelings of depression. Lastly, next to these more temporary circumstances, long-term problematic situations might also result in a stress-related disorder.

For students the start of their study can mean big lifestyle changes and can be seen as a major life event. Oftentimes they move out of their parents' house into a new city where they might not know anybody else. Homesickness, living independently and with strangers and the different lifestyle at the university are some common problems, especially in freshmen students (Stroebe, Van Vliet, Hewstone, & Willis, 2002; Student Minds, No date; Thurber & Walton, 2012). Furthermore, students experience uncertainty about their future, or 'future development stress', which entails the fear of being unemployed after graduation and

uncertainty about life planning in general (Lin and Huang, 2014) and are confronted with different competing demands like extracurricular activities, part-time work, different forms of activism or family demands (Schaufeli, Leiter, & Maslach, 2009; Vaccaro & Mena, 2011).

Being less involved with the university, not being flexible in the learning process and having a high subjective workload can lead to increased stress and risk of burnout (Chang, Rand, & Strunk, 2000; Jacobs & Dodd, 2003; Neumann, Finaly-Neumann, & Reichel, 1990). Additionally, character traits like pessimism, neuroticism or having a high self-expectation increase the likeliness of stress or burnout (Chang et al., 2000; Sulea, Van Beek, Sarbescu, Virga, & Schaufeli, 2015; Van Baar, 2015). Higher levels of extraversion and agreeableness on the other hand are related to lower levels of burnout. Furthermore, self-compassion works as a moderator between academic burnout and psychological well-being (Kyeong, 2013), attenuating the effects of academic burnout. This all shows that there is a broad range of causes for stress in students that need to be taken into account when looking to prevent and treat student stress.

Treatment and prevention

While there are different stressors that play a role in students, and student stress has become an increasing problem, there are commonly used ways of decreasing stress. In the general population, relaxation exercises and stress management training, group interaction, cultural activities and cognitive behavioural approaches were all found to reduce symptoms of stress or burnout (Berger & Friedman, 1988; Grape Viding et al., 2015; Iancu, Rusu, Măroiu, Păcurar, & Maricuțoiu, 2017).

A review of student populations found that interventions that focus on cognitive, behavioural and/or mindfulness techniques reduced stress in university students (Regehr, Glancy, & Pitts, 2013). Furthermore, Bamber and Morpeth (2018) reviewed studies that looked at the effect of mindfulness meditation on stress and anxiety and found that the

mindfulness meditation generally decreased college students' anxiety. Baghurst and Kelley (2014) found stress management and physical activity to be the best strategies for treating and preventing burnout in students. Their studies showed that education on the positive effects of physical activity decreased stress levels. Furthermore, resilience and coping skills enable students to deal with stressful situations (Dunn, Iglewicz, & Moutier, 2008). Mentioned examples of interventions are mindfulness, mentorship and healthy lifestyle initiatives. Ideally, some part of this training could be included in the curriculum or a program to decrease stigma (IsHak et al., 2013). To summarize, there is a variety of treatments that can be effective against student stress.

However, while there are these different options for treatment, it is important that students recognize their problems first and seek help. However, Mackenzie, Erickson, Deane, and Wright (2014) found that students are often reluctant to seek help for mental health issues because of stigmatization. Additionally, students prefer talking to peers rather than contacting a professional (Atik & Yalçin, 2011). These results show that while treatment options might be available, this does not guarantee that students make use of them. Therefore, the threshold of starting to use an intervention should be kept low, to increase the probability of uptake.

Furthermore, reviews found that studies often focus on a small homogeneous group of students, for example mainly on female students, so the positive effects are not guaranteed for all students (Bamber & Morpeth, 2018; Regehr et al., 2013). Because of this focus on specific groups, only a small fraction of the student population benefits from the intervention. The aim should be to develop an intervention that fits the needs and wishes of as many students as possible.

Technology

By making use of technology in an intervention, the threshold for users to participate can be lowered. Lungu and Sun (2016) found that students are generally in favour of technological

solutions for emotional distress. Specifically, they asked students whether they were willing to use serious gaming, and the majority agreed. While Stellefson et al. (2011) also found students to be in favour of using eHealth, they concluded that students were not always doing so because they lacked “skills related to searching for, retrieving, using, and evaluating sources of eHealth information”. This emphasizes the importance of a well-grounded technology by a credible source to increase the uptake in the student population.

Generally, there is little research into the possibilities of technology for stress reduction in students. However, several universities have made a start in developing mental health technology at and for their institution, for example the University of California, Los Angeles (UCLA), the University of Amsterdam (Universiteit van Amsterdam, UvA) together with the Amsterdam University of Applied Sciences (Hogeschool van Amsterdam, HvA) and the ‘Caring universities’ program (Caring Universities, No Date; "Check In Survey and iCBT," 2017; Van der Heijde, Vonk, & Meijman, 2018). These programs offer free web-based mental health interventions to students. Outside of the university context, others also provide technological interventions to decrease stress, like for example the eQuooGame (PsycApps Limited, 2018) that teaches skills in order to increase mental wellbeing. However, no scientific evidence of the effects has been given yet for any of these interventions and it is unclear whether any of the approaches fits the needs and wishes of university students.

As research into this topic is just starting and there is not yet much knowledge about what technologies provide a good fit with students, a systematic developmental approach is needed. A key element to ensure good fit with users is their continuous involvement in the development process. As Maguire (2001) describes, involving potential end users in the development process can increase the uptake and effectivity of a new technology by ensuring that the needs and wishes of the users are met (J. E. W. C. Van Gemert-Pijnen, Peters, &

Ossebaard, 2013). This approach of human centred design is one of the core principles of the CeHRes roadmap, which will be explained subsequently.

Technology development

The CeHRes roadmap that was developed by J. E. van Gemert-Pijnen et al. (2011) and helps systematically develop the best technological solution in any given context. This roadmap is a framework that can be used in the development of eHealth technologies. It consists of five main steps as well as iterative evaluations between steps. The first step, the contextual inquiry, encompasses the description of the context, needs, and problems at hand as well as gaining insight into possible stakeholders. To achieve this, possible methods are desk research or interviews or focus groups with different stakeholders. Next follows the value specification, in which the information that was gathered is translated into requirements for the new technology, again in close contact with stakeholders. During the design phase, a prototype is drafted and tested with possible users. In the fourth phase, the operationalization, a business model for the implementation of the technology is developed and the technology is put into practice. Lastly, the summative evaluation looks at the different effects of the developed product. Furthermore, cycles of formative evaluation take place during and after each stage to ensure that the process is going in the right direction. By following these steps for the development of a new technology, there is a high chance of a good fit with possible users.

Aim of the study

The questions that will be addressed in this research are fourfold; (1) ‘What is the current process with regard to treating student stress at the UT and what are possible points of improvement?’ (2) ‘Which different target groups should a technological intervention for stress in students at the UT be aimed at?’ (3) ‘What are the needs of key-stakeholders like students and counselling staff for this intervention?’, and (4) ‘What are the main values and

features that should be included in such an intervention?'. Depending on what will be found during this study, a prototype for a possible eHealth intervention for student stress can be developed.

Overview of methods

An overview of the research questions, the corresponding methods and steps in the CeHRes roadmap can be found in Figure 1. As the sub-studies build upon each other and follow from previous results, for each part the method, results and implications for further research will be discussed individually before turning to the next step. All results are discussed together and conclusions are drawn based on the full study.

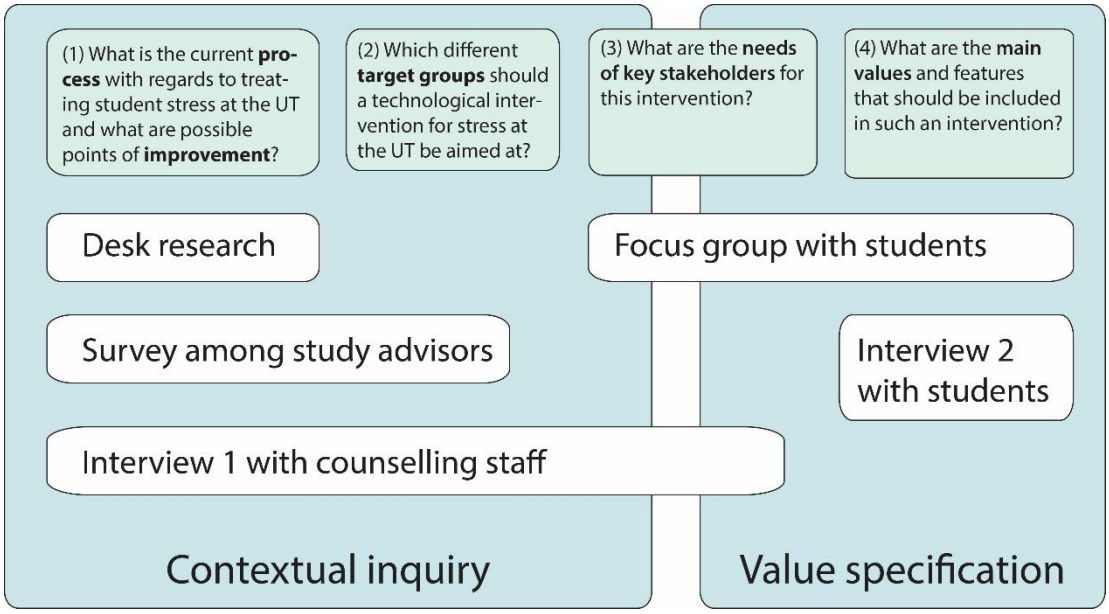

Figure 1. Overview of the research questions and methods used per phase of the CeHRes roadmap.

Desk research

Method

To get a better view of the context at the University of Twente, desk research was conducted in September and October 2018. The website of the university was searched for general information on the number of students and the composition of this student population with

regards to international students. Furthermore, research was done into specific factors that might play a role in student stress at the UT. Therefore, information on characteristics like the type of educational program, financing and extracurricular activities was included. These characteristics were based on previous knowledge of the universities characteristics and the Dutch educational system. Then, literature on the relationship between these factors and student stress was consulted.

Lastly, information on different types of counselling at the UT, such as study advisors and the student psychologists' office, was sought. This was done to identify the different types of support that these instances offer. The descriptions of the counselling services were read to get a clearer picture of the role of each counselling party in providing help to students.

Results

General information. The University of Twente (UT) is a Dutch university located in the city of Enschede, in the East of the Netherlands, close to the German border. In 2017 approximately 10.000 students studied at the UT, of which 5.489 were bachelor students and 4.010 were master students (University of Twente, 2018). More than 2.600 of those students were international students. Of these, approximately half come from Germany, but 78 other nationalities are represented as well. All buildings of the university are located on a campus together with student housing, sports- and other facilities.

Factors influencing student stress. The University of Twente is no exception to the increasing numbers of burnout in students (Kuipers, 2018). Different factors that might contribute to the increase in stress in students were identified, and will subsequently be discussed in more detail. These factors are the educational model at the UT, student activism, changes in the student loan model and internationalization.

Firstly, the UT makes use of a unique educational model that includes partial exams instead of one final exam. Furthermore, this program, called the Twente Educational Model

(TEM), lays an emphasize on project work with small groups of students. The TEM also entails that students must pass all module components (usually 15 European credits (EC) during a period of ten weeks) in order to earn the credits. However, this system has been adapted a bit during the last year, allowing for more exceptions where 5 or 10 EC can be obtained as well. Still, this high workload puts a lot of pressure on students and might therefore make them more prone to burnout (Bowyer, 2012).

There are several forms of student activism at the UT. Many students work in committees or student teams during their studies or become members of a student board. Activism is promoted as a means of developing skills next to those that are taught in the study programs. The university also shares stories of student activism on their website. It was shown by Vaccaro and Mena (2011) that too many competing demands, like participating in many different activities next to studying, can lead to an increased risk of burnout.

With the change of the student loan model in the Netherlands in 2016 came an increasing pressure on students to finish their studies without any delays and thus avoid having to pay back higher student loans (Van Dinther, 2018). This development has in turn lead to increased stress in those students that loan money (NOS, 2018). Students tend to work more than before the student loan model changed and sometimes make sacrifices in their university work for their paid work (Van der Werf, Schonewille, & Stoof, 2017). Having to work next to studying at a university can lead to ‘work-university conflict’, which in turn was related to aspects of burnout (Lingard, 2007).

Lastly, the number of international students at the UT has increased in the past few years. Furthermore, being ‘internationally oriented’ is mentioned as one of the core values of the university. As part of this process, 16 of the 20 bachelor’s programs and 34 out of 37 master’s programs are taught in English. There are several aspects of studying in a foreign country that can increase stress. Having to adapt in a foreign culture can lead to increased

stress for reasons like language barriers or being unfamiliar with the local lifestyle, culture and schooling system (Chen, 1999; Mori, 2000). Furthermore, Lungu and Sun (2016) found that there may be cultural differences when it comes to actively seeking help. In their study, participants of Asian descend where less likely to ask for help when facing emotional distress.

Counselling. There are different people that are expected to be in contact with students that experience stress and stress-related disorders and therefore are likely to have the best overview of the problem at hand. These are the study advisors, the student psychologists and, to some extent, the student counsellors.

Every program at the UT has its own study advisor, and in some cases there are also different advisors for the bachelor's and master's programs (University of Twente). The study advisors are among the first people that students can come to when experiencing problems during their studies. According to the website of the UT, study advisors mainly help with questions regarding educational matters but are open to discuss other subjects as well.

Furthermore, the UT also provides the service of a student psychologists' office (University of Twente). The student psychologist is the contact person for students that experience different personal problems, like mental health issues or problems with parents. All appointments here are free of charge and no reference is needed to make an appointment.

Lastly, there are student counsellors at the UT (University of Twente). They can provide advice on topics like regulations, appeals and legal procedures. For other issues like study delay or personal circumstances, the website advises to first contact the study advisors, before getting in contact with a student counsellor.

Implications

As mentioned above, the TEM, student activism and the focus on internationalization are important characteristics of the University of Twente. Furthermore, the impact of changes in

the student loan model for Dutch students in general were outlined. Looking at these findings in the light of literature shows that the abovementioned factors can cause the onset of student stress. However, not all mentioned aspects might play an actual role in the onset of student stress, or there might be other aspects that were not found before. Therefore, more information from sources within the UT is necessary to explain student stress there in more detail. As it became clear from the results of the desk research that the study advisors and the student psychologists were most likely to see students experiencing stress, they were included in the next parts of the research.

Survey

Method

Goal. The main aim in this stage was to get a clearer view of the current process with regard to treating students stress, possible improvements of this process and the identification of at-risk groups.

Participants. For this purpose, an online survey was emailed to the 33 study advisors at the UT, of which 13 responded. Of these, five worked for the faculty of Behavioural, Management and Social Sciences (BMS), three for Engineering Technology (ET), two for the faculty of Electrical Engineering, Mathematics and Computer Sciences (EEMCS), two for Science and Technology (TNW) and one for the faculty of Geo-Information Science and Earth Observation (ITC).

Procedure and materials. The survey was sent to the official organisation email addresses of all study advisors in October 2018. After two weeks a reminder was sent to those that had not replied yet. The participants were asked to email their answers back to the researcher. No further instructions were given. The survey could be answered within five minutes, depending on the length of the answers given. A short introduction about the researcher and the study at hand was given at the beginning of the survey as there had been

no previous contact between the researcher and the participants. The survey itself contained open-ended questions about whether the study advisors had contact with students with stress or burn-out symptoms. Furthermore, the study advisors were asked how they perceive the occurrence of stress and burnout in the student population of their respective program and whether there had been an increase in this. Lastly, a question about possible reasons of stress in students was included. All questions that were asked can be found in Appendix A. In the same email, study advisors were asked whether they were willing to participate in an interview on the subject as well.

Analysis. The full content of the email replies was included in the analysis of the surveys. These results were analysed using open coding in ATLAS.ti. All results were coded by the researcher. The codes were developed inductively for each question.

Results

All 13 study advisors that answered the survey stated that they do see students with burnout or stress-related problems in their practice. However, the number of students seems to vary, with some study advisors saying that they rarely see students with burnout and related symptoms (n=4) while others mention that the number of students that experienced these problems has increased in the previous years (n=3). The remaining participants did not specifically mention the number of students with stress related symptoms that they see (n=6).

Most study advisors explicitly stated that there are various reasons for student burnout (n=8). An overview of the mentioned reasons can be found in Table 1, together with the results of the interview study, which is the next step of this research. Specific examples that were mentioned are study load and expectations from the study program (n=7), fear of missing out and wanting to do too much (n=6) and high expectations and not allowing oneself to make mistakes (n=6). Within the expectations and load from the study program, different aspects were mentioned, for example the binding recommendation of having to

achieve at least 45 EC in the first year of studying (n=3) and the change in the student loan model (n=2). Next to the expectations from the program the students have their own expectations to manage as well, concretely "*having the feeling that you must always be pretty, successful, etcetera*" or "*wanting to do everything well […] sometimes extremely ambitious*". As an example of fear of missing out, one study advisor mentioned that "*oftentimes students can't choose between activities and want to do everything: active on social media, sport, association, house and study*". Often, this "*does not fit within the hours of a day or week*". Less frequently reported causes of burnout are social media (n=2), being in a different environment, away from home (n=2) and having to work next to the study (n=2). Financial pressure and expectations from parents are mentioned as specific reasons for burnout in international students (n=2).

Implications

The survey showed that study advisors see students with stress-related problems. Some possible reasons for stress and stress-related issues in students were mentioned. These findings are supported by literature as well. For example, fear of missing out has been linked to depressive symptoms (Baker, Krieger, & LeRoy, 2016) while high subjective workload was found to be related to higher levels of burnout in students (Jacobs & Dodd, 2003). Furthermore, the fact that student stress is encountered by all participants, and has in some cases even increased in the previous years, emphasizes the need of more research on the topic. Specifically, more information on the key stakeholders and possible targets groups and their needs should be gathered. To gain more insight into the counselling that students with stress are currently receiving and into how this could be improved in the future, interviews were scheduled with some of the study advisor as well as with a representative of the student psychologists' office.

Interview I

Method

Participants. Before conducting the interviews, approval was requested from the ethical committee of the faculty of Behavioral, Management and Social Sciences (BMS) and was granted on September 27th (application number 18784).

Three interviews were held with study advisors from different programs. The programs were all part of a different faculty, namely Behavioural, Management and Social Sciences (BMS), Electrical Engineering, Mathematics and Computer Sciences (EEMCS) and Science and Technology (TNW). The programs which the study advisors represented also differed in other aspects such as size and the number of international students. Furthermore, a student counsellor from the student psychologists' office was interviewed.

Procedure and materials. The semi-structured interviews lasted between 30 and 60 minutes. All interviews were conducted in the office of the respective interviewee and were recorded, after participants signed an informed consent form allowing this. An interview scheme was developed so that similar questions would be posed during each interview. After the development of this first interview scheme, a pilot interview was conducted with one of the supervisors of this project, and some adjustments were made to the interview scheme. Firstly, some general questions were asked to determine whether the respondent encountered student burnout and stress-related symptoms in their practice. Possible reasons for these complaints were discussed. Afterwards, the interviewee was asked to describe the typical steps that a student follows before and after contacting them about their stress. All steps in this process were subsequently discussed to determine what worked well and where improvement was possible. Lastly, the participants were asked whether there was any specific target group they thought would benefit most from a newly developed intervention. The full interview scheme can be found in Appendix B.

Analysis. Based on the audio recordings, verbatim transcripts of the interviews were made. The code scheme that was used for analysing the surveys was used as a basis for the analysis. New codes were added inductively during analyses of the interviews. Again, one coder analysed all results using ATLAS.ti.

Results

Stress level in students. All interviewees agree that the attention for mental health in general, and stress and burnout more specifically, has grown. However, it was stated in two of the interviews that the stress level in students might not have increased in the past years, contrary to what was said in media articles. One participant pointed out that "*the threshold of talking about stress is lower and I think that is why we hear about it more*".

Another new aspect that was mentioned in all interviews is that students often act too late and that they could be helped sooner and better if they were to contact a study advisor or student psychologist earlier.

Reasons for stress in students. Some reasons for stress in students that were given were also mentioned before in the surveys. A comparison of the codes between the survey and the interviews can be found in Table 1. However, the participants in the interviews did see the reasons for stress differently from the survey participants. They agreed that while the TEM and expectations from the educational program can increase the feeling of being stressed, they are not the main cause or onset of stress in students. Instead, it was mentioned that characteristics ascribed to the generation of current students or the time that we live in, and coinciding personality traits, play a bigger role in the onset and perception of stress, which was summarized in the code 'Personality'. Examples are that current students typically belong to what one participant called "*the applause generation*", meaning that they are used to being praised for everything that they do. Another aspect of this point is what was called the "*illusion of manufacturability*", which means that people believe that everything can be

fixed if approached the right way (n=1). The participant related this to a general belief in a "*protocol of happiness*" and said that to students it feels like "*it is your own fault if you do not have a good time*".

Another interviewee mentioned that students often feel like they are the only one encountering certain problems. Therefore, not being in contact with others and putting your problems into perspective was added as another possible reason for student stress.

Table 1

Comparison of codes describing reasons for stress in the surveys and interviews, in alphabetical order.

Code	N in survey (out of 13) (%)	N in interviews (out of 4) (%)	Example quote
Disability/ Illness	1 (8%)	0	'do not want to take their condition (e.g. autism) into account'
Expectations from study program	7 (54%)	3 (75%)	'high workload'
External expectations	1 (8%)	4 (100%)	'the pressure from businesses […] is very high'
Fear of missing out	6 (46%)	3 (75%)	'oftentimes students can't choose between activities and want to do everything: active on social media, sport, association, house and study'
International	2 (15%)	3 (75%)	'international students are a separate target group, with their own problems'
New living environment	2 (15%)	2 (50%)	'new social environment'
Own expectations	6 (46%)	3 (75%)	'perfectionism'
Part time job/ working next to study	2 (15%)	0	'during graduation some students already have a job'
Personality	0	4 (100%)	'the feeling that you have to be good at everything, know how to do everything has increased'
Social media	2 (15%)	3 (75%)	'I think social media puts a lot of pressure on students'
Various reasons	8 (62%)	1 (25%)	'the causes of stress are very diverse'

Current intervention process – Study advisors. The process that a student goes through when looking for support was described in the same way by all participants, regardless of the

study program. When students contact the study advisor about stress, the study advisors usually starts by assessing whether it is enough to help the students with tasks like "*study skills, making a planning […], separating main tasks from secondary tasks [and] studying more efficiently*". If those skills are enough to help the student, a referral to the student psychologists' office is usually not necessary, but the study advisors nevertheless stay in contact with the student to check whether more help is needed.

In case the study advisors feel that the problems are more severe, the student is referred to the student psychologists' office. While the study advisors will still keep in touch with the student they do not always know whether the student followed up on their referral. Furthermore, one interviewee mentioned that "*students that contact the student psychologists' office themselves are not often referred back to the study advisors*". Additionally, some participants had the feeling that "*there is not much consultation between the study advisors and the student psychologists*" or that they get no feedback whether they were right in their decision to refer a student to the student psychologists' office (n=2). It would therefore be an improvement to increase the communication between both parties. Furthermore, making sure that a student reaches the right person decreases unnecessary referral and prevents students from not being helped by the right person. This could in turn make the process go more smoothly and provide students with better care.

Current intervention process – Student psychologist. The student psychologists' office has a standardized procedure of entry. Students are either referred by a study advisor or register themselves. Before their first orientational meeting they need to fill in a questionnaire about certain complaints. After that, the student has a right to five individual meetings and then sometimes students are referred to other mental health institutions. The student psychologists' office also offers a couple of group interventions, for example on autonomy or self-management and an "*outreach group for international students*".

There are sometimes students that have already seen a GP or psychologist outside of the university and were for example diagnosed with burnout. They do get in contact with the study advisor for adaptations in the study program and the study advisors usually keep in regular contact with them to monitor the development and help where necessary. However, these students are not referred to the student psychologist.

The student psychologist expects that there is another group of students that does not seek help with the student psychologists' office, even thought they might need it, for example "*people who are ashamed and for whom the threshold [of going to see a professional] is too high*". An adaptation of the current process to make care more accessible to those students would therefore be very beneficial.

Possibilities for a new technological intervention. There was no specific mention of a technological intervention to support the counselling for students with stress that is currently being used by either of the interviewees. However, it was mentioned that the student psychologists' office has the intention to work with eHealth in the future.

When asked which group would be in need of a technological intervention most, several groups were indicated by the participants. As mentioned before, all interviewees suggested that international students encounter specific problems, like "*financial pressure […] or social pressure from parents*" and might be more vulnerable to stress than Dutch students because they do not always have their trusted network around them. However, it was also mentioned that Dutch students that move out of their parents' house when they start studying experience a similar situation as they are new to the environment as well and need to learn how to live on their own. Other student groups that were specifically mentioned as experiencing stress or burnout were students that are graduating (n=1) and students that are active in a committee or board (n=1).

Generally, the participants were open to the idea of using technology to decrease

stress in students. Specific advantages that were mentioned were that this approach might fit with the technological mindset of the students and the possibility of reaching students that would not normally sign up. However, one interviewee mentioned two possible outcomes of giving the option of online sign up. On the one hand, a whole different group that would usually not contact the study advisor or student psychologists might make use of a technological intervention. On the other hand, it was also mentioned that this might just lead to a shift from people that would usually sign up at the study advisor or student psychologist and would then make use of a technology instead.

One interviewee said that it would be good to give students "*tools, so that they do not have to come and see me*". An example that was mentioned in two of the interviews is to provide mindfulness instructions. It was pointed out that the instructions and way of presenting this to students is very important. Firstly, students might not perform the exercises in the intended way if no instructions are given or if those instructions are unclear. Secondly, students from technical programs sometimes perceive exercises like mindfulness as "*floaty*" or "*psychological chitchat*" until it is explained to them "*that this is very practical, you are doing a task-concentration exercise*".

Implications

The results of the interviews gave an overview of different at-risk groups for, and reasons of, students stress and illustrated the current process of helping these students. It was pointed out that certain target groups like international or technical students have specific wants and needs for mental health treatment. As it was mentioned earlier, international students might approach seeking mental health treatment differently (Lungu & Sun, 2016). Furthermore, while Huerta (2018) found that engineering students were open to the idea of online mental health treatment, in this case mindfulness practices, it seems that this needs to be implemented in a way that fits the need of this target group. While the previous studies

focused on the opinion and view that the counselling staff holds, students, being the main stakeholder for a possible intervention, need to be included in the design process as well. Therefore, it was decided to discuss some of the outcomes with students in the next step.

Focus Group

Method

Goal. Scenario's were drawn up based on what was described in the interviews. These scenario's were discussed with several focus groups to gather insight into the students' opinion on possible solutions for student stress.

Participants. Ethical approval was requested, and granted by the ethical committee of the faculty of Behavioral and Management Sciences (BMS) on November 19th, 2018 (application number 18892). Participants for the three focus groups were recruited both from the network of the researcher as well as via the test subject pool of the University of Twente, SONA. A short message was placed on Facebook and shared via WhatsApp, describing the aim and procedure of the research. This message was also shared in a Facebook group specifically for international students at the UT. A similar call was placed on the website of the test subject pool where mainly first and second years students from psychology and communication sciences can sign up to earn credit.

The first focus group consisted fully of participants from the SONA pool (n=5), the second of participants recruited via social media (n=2) and the network of the researcher (n=4) and the last of a mix of SONA participants (n=2) and participants from the network of the researcher (n=3). A description of the demographic characteristics of each group can be found in Table 2.

Table 2

Demographic variables of the participants for each focus group.

Group	Gender	Nationality	Study progress
1 (n=5)	Female 3 (60%)	Dutch 0	Freshmen students 5 (100%)
	Male 2 (40%)	International 5 (100%)	Older students 0
2 (n=6)	Female 6 (100%)	Dutch 4 (67%)	Freshmen students 0
	Male 0	International 2 (33%)	Older students 6 (100%)
3 (n=5)	Female 2 (40%)	Dutch 2 (40%)	Freshmen students 1 (20%)
	Male 3 (60%)	International 3 (60%)	Older students 4 (80%)

Procedure and materials. In December 2018, three focus groups of 90 minutes each were conducted. Upon arrival at the focus groups all participants were first asked to fill in the perceived stress scale (Cohen, Kamarck, & Mermelstein, 1983). The scale consists of 14 questions that are scored on a 5-point Likert scale ranging from ‘never’ (0) to ‘very often’ (4). After all participants completed the scale, the focus group started. A short introduction was given about the current research and the procedure of the focus group. For all of the following parts of the focus group, participants were first asked to write down their answers for themselves, afterwards these were compared and discussed with the other members of the group. The discussion started off with some questions about how stress can be recognized and what ways there are to cope with stress. Furthermore, participants were asked whether they could envision a role for technology in this process. These questions can be found in Appendix C. In the next part, two or three scenarios out of a set of three were discussed, depending on the time. These scenario’s were developed based on the information that was gathered during the interviews. The scenario’s described stereotypical students that encounter stress in their life, one being a freshman, the second an international student and the last a student in the process of graduating. Other characteristics were added based on what was described by the participants in the previous parts of the study, for example homesickness, financial struggles or the impact of social media. All groups stated that the scenario’s were very realistic and recognizable, either from their own point of view or from what they saw in

other students around them. The three scenario's can be found in Appendix D. For each scenario the participants were asked to think of different technological interventions that could help the person in question deal with their stress better. Prompting questions were presented on slides to give them some idea of what to think about (Appendix C). To round off the focus group some questions were asked about whether the participants themselves would be open to using some of the ideas that were discussed and how they experienced the focus group in general.

Analysis. Stress scores were calculated from the perceived stress scale as described by Cohen et al. (1983). A mean score was calculated for each individual group as well as for the total group of participants. The answers written down by the participants were digitalized and additional remarks made during the discussion were added based on the recoding of the session if they made the suggestion clearer or if a new part of the idea was introduced during the discussion. The results were coded by one researcher using inductive coding in ATLAS.ti.

Results

Stress scores. The overall mean stress score was 27.85 (possible range 0 to 56), which is higher than the mean scores of 23.18 and 23.67 found in student samples by Cohen et al. (1983). The mean, minimum and maximum score for each group can be found in Table 3. In the group of SONA students one of the five participants did not complete the whole scale, this survey was disregarded.

Table 3

Mean, minimum and maximum score on the perceived stress scale per group.

Group	Mean	Minimum	Maximum
1 (n=4)	23.75	15	37
2 (n=6)	30	22	37
3 (n=5)	29.8	14	41
Total	27.85	14	41

Recognizing and dealing with stress. All students were able to identify stress in themselves and in others. The characteristic behaviours they described are listed in Table 4, together with mentioned actions to deal with stress. While most techniques were evaluated as positive and helpful in dealing with stress, participants also named some techniques that they categorized as 'bad' themselves, like smoking, eating or procrastinating (n=6).

Table 4.

Characteristics of feeling stressed, ways to deal with stress and the number of mentions.

Characteristic behaviour	**N**
Tension/ tiredness	11
Bad mood (in themselves)	11
Feeling of being overwhelmed	8
Unhealthy habits (smoking, eating)	3
Agitation/ negative mood (in others)	3
Ways to deal with stress	
Sporting	9
Making overview/ schedule	8
Talking to others	6
Working through it	6
'Bad behaviour'	6
Meditation	5

Possibilities for a new technological intervention. As there was a lot of overlap between the general ideas mentioned at the start of the focus group and the specific suggestions given for the scenario's later on, both will be discussed together. For ideas brought up during the discussion of the scenario's, the numbers in brackets indicate how many times a suggestion was brought up, independent of whether it was mentioned several times by the same person, hence the higher numbers.

When discussing the scenario's, an idea that was brought up was a technology that helps communicate with peers in the same situation or that helps putting your own stress into

perspective by showing that others often feel the same way (n=28). Another idea that was frequently mentioned was using reflection and feedback through technology to get insight into behaviour and stress level (n=18). An organizing tool or time manager app was suggested as a good technological solution both during discussion of the scenario's (n=16) and in the general discussion (n=8). Another idea that was mentioned generally (n=3) and for the specific scenario's (n=15) was the inclusion of exercises like meditation or sport, for example via an app or "*meditation class online*", but also in the form of "*informative videos of the Dutch culture*" to promote inclusion of international students or suggestions for healthy eating. Links or referral to professionals like the study advisor or student psychologist were also generally seen as a useful addition (n=10).

Examples of what can support students in recognizing stress are biofeedback (gathering data on physiological functions) (n=1), technologies to analyse mood or emotions (n=1) and tracking of health behaviour like walking or sleeping (n=1).

Some participants were worried that a technology to decrease stress could be counterproductive and actually increase the feeling of agitation or that it might only be a short-term solution (n=3).

Implications

Different ideas of what a good technology to decrease student stress might look like were brought up during the focus groups. The main categories were a technology to help put your own stress into perspective, the use of reflection and feedback, an organization or time management tool, meditation exercises and a technology that enables users to contact a professional. However, as the ideas were only broadly discussed, no concrete values and requirements for these technologies were determined yet. Furthermore, another focus point in the CeHRes roadmap that was not taken into account until now in this study is the continuous attention for the implementation of a technology and how this can be included in research

early on. Up until this point, little attention was paid to for example the way that students would be informed about a technological intervention. As the idea of what the technology could look like becomes clearer, it is important to start thinking about this as well.

Interview II

Method

Goal. To see how students feel about existing examples of the suggested technologies, another set of interviews was conducted. Existing examples of technologies were presented to students to identify important values for each idea and to determine which aspects should be included in a prototype. Furthermore, students were asked about their preference for receiving information about the possible technological intervention, to get a better idea of what the implementation process could look like.

Participants. The ethical committee of the faculty BMS gave approval for an interview study on March 15th, 2019 (application number 190255). The target group of the interviews were students at the University of Twente. Participants needed to be proficient in English in order to fully understand the technologies and the interview questions. No further inclusion criteria were used. In total, 18 interviews were conducted, including one pilot interview after which no significant changes were made to the interview scheme. Nine participants were recruited via the SONA subject pool while the other half was recruited via convenience sampling through social media and the network of the researcher. Table 5 shows the demographic variables of the interviewees. The average age of participants was 22 (range between 18 and 27).

Table 5.

Demographic variables of the interviewees (n=18).

Gender	**N**
Female	12 (67%)
Male	6 (33%)
Nationality	
Dutch	9 (50%)
International	9 (50%)
German	6 (33%)
German-Spanish	1 (5%)
Bulgarian	1 (5%)
Indian	1 (5%)
Study Progress	
Bachelor	9 (50%)
Master	9 (50%)
Study Program	
Psychology	10 (56%)
Computer Sciences	3 (17%)
Chemical Sciences	3 (17%)
Communication Science	1 (5%)
Technical Medicine	1 (5%)

Procedure and materials. All interviews were conducted in March and April 2019. The full interview scheme can be found in Appendix E. The semi-structured interview started with a general explanation about the subject and structure of the study. In the next part, open-ended questions were asked about where students would go to look for mental health information or to receive counselling. After the participant had given their answer, other possible channels, like for example the student psychologist, study associations or the UT website, were presented to them and they were asked to give their opinion on each suggestion. For the next part of the interview, webpages of five different technologies were presented, together with a short description of a situation where this technology might be used. These example technologies were chosen based on the suggestions that were given during the focus groups. The examples that were presented to the participants were a student mental health blog (Student Minds Blog), a website about online meditation exercises (Headspace), an online journal for personal reflections (5 Minute Journal App), a to-do list application (Wunderlist)

and the website of a student mental health program (MindMates). An exemplary screenshot and the links to these technologies can be found in the interview scheme in Appendix E. Some participants reported being familiar with some of the apps. Five participants said that they had used or were currently using Headspace. Furthermore, five were familiar with it, while the other eight had not heard about it. Two participants had used Wunderlist before. The other technologies were new to all participants.

First, the participants had a bit of time to get acquainted with the technology, in case they were not familiar with it. Then, they were asked to voice everything that came to mind with regard to this technology. At the end of the interview the participants were asked about their general preference when looking at all technologies. Afterwards, there was room for questions or general remarks from the interviewees. On average, the interviews took 27 minutes (range: 16 to 36 minutes).

Analysis. The analysis, like the interview, was twofold. Firstly, the participants' opinion about the information channels was analysed. For each of the mentioned channels, they had to indicate whether they were positive about this channel or not. The number of students that were positive and negative were counted for each channel. Any more specific remarks or clarifications were also taken into account and inductively coded. Secondly, the results regarding the different technologies were analysed. The main comments with regards to benefits and disadvantages of the different technologies were written down by the researcher. Those were later inductively categorized into more concrete values for each technology. Lastly, an overview of those technologies that were seen as most useful by the participants was made.

Results

Information channels. Most of the 18 participants reported that they were most likely to seek mental health information from study advisors (n=14) and the student

psychologists' office (n=14). A few students were initially not aware of the student psychologists' office (n=4). Some participants reported that if they had a personal bond with their teacher they might go to them for mental health support (n=7), while others mentioned that their personal bond with teachers (n=8) and mentors (n=6) was not strong enough to seek mental health information there. Some students also stated that they would initially look on the UT website for information (n=7).

The preferred way of being informed about the different counselling options at the UT was including the information in a lecture talk, for example at the start of the quartile (n=15). Participants were also enthusiastic about a personal messages, for example via email, including all the information (n=11) or having a system of fellow students that act as mental health ambassadors (n=10).

With regards to how an intervention should be presented to students, most participants preferred either a website (n=10) or an app (n=6). Mentioned reasons were that these technologies fit their lifestyle the best and that they were easily accessible. Opinions were mixed about technologies like a forum or a blog, there were equal amounts of participants sceptic as positive about them. Some participants felt that they were 'too old' to read blogs or did not like the idea of exposing their mental health struggles in a blog. However, others saw these technologies as another low threshold way of connecting to others.

Technologies. The main advantages and disadvantages that participants perceived for each technology can be found in Table 6 and 7. Participants appreciated the personal content, variety of options and clear structure of the technologies but disliked some technologies that they did not perceive as useful or necessary for themselves. Overall, there were more positive remarks than critical ones for each of the technologies.

Only four participants noticed the test to measure your mental health on the website pf MindMates. However, all of them were enthusiastic about this idea, and suggested that the

results could then link you to a technology that might be useful for you, like Headspace if you have trouble relaxing or Wunderlist if you are struggling with planning your tasks effectively.

Table 6.

Overview of the mentioned positive aspects for each technology.

Student Minds Blog	**Headspace**	**Five Minute Journal App**	**Wunderlist**	**MindMates**
Personal and relatable (n=10)	Structured, well designed (n=9)	Daily reflection is useful to decrease stress (n=8)	Variety of features (n=6)	Having a fellow student to talk to (n=7)
Well structured, good overview (n=9)	Useful explanations and tips 'how to get started' (n=8)	Positivity (n=5)	Helpful for creating an overview (n=6)	Possibility to attend workshops or activities (n=3)
Good content, 'feeling prepared' section is useful (n=5)	Meditation is useful to decrease stress (n=6)	'Quick and easy' (n=3)	Useful to decrease stress levels (n=4)	Possibility to become a buddy yourself (n=2)
Link with different sites, good starting point (n=5)		Appealing look (n=5)		

Table 7.

Overview of the mentioned negative aspects for each technology.

Student Minds Blog	**Headspace**	**Five Minute Journal App**	**Wunderlist**	**MindMates**
Chaotic, too much text (n=4)	Meditation perceived as floaty (n=5)	Not necessary, can be done without app (n=4)	Not necessary, can be done on paper/ with other apps (n=7)	Feeling pressure to attend activities would increase stress level (n=2)
Not useful to decrease stress, talking in person would work better (n=3)	Costs money (n=4)	Daily use can become annoying (n=4)	Not useful to decrease stress, just gives a better overview (n=3)	
	Meditation does not work for everyone (n=4)			

Combination of technologies. When asked which technology they thought to be the most useful, some participants mentioned that a combination of the Student Minds Blog and MindMates would be most useful to them (n=6). An advantage of combining the two was that personal contact would be available both online and offline. This way, the technology

could make use of the structured overview of the blog as well as the lower threshold of seeking help through a buddy system. Students also mentioned that they could find technologies similar to Headspace, the 5 Minute Journal App or Wunderlist online by themselves, but that the more personal approach of the Student Minds Blog and MindMates made those more attractive and unique. However, it was suggested to include links to those technologies in one of the blogs or to promote them via the buddies, effectively combining all presented technologies. Furthermore, four participants mentioned that the promotion and information about current counselling options of the UT could be improved, so that you can easily find where you need to be to find certain information or get the right counselling.

Lastly, the participants that saw the mental health test on the MindMates website suggested that more personalized care and tips could be provided based on the test results.

Implications

It became apparent that there is no one technology that all students like or dislike. Rather, there were always some positive and some negative remarks. This shows that students have widely different preferences and that a ‘one size fits all’ approach for a student mental health technology is not feasible. Generally, students did prefer the personal rather than practical technologies. Therefore, offering personal help to students should be a main objective of any to be developed technology. Furthermore, to cater to the different needs and preferences of students, combining several of the mentioned examples into one technology was seen as a fruitful possibility by the participants. To translate these findings in a way that makes them useful or the further development process, values were developed next.

Value development

Method

The basis for the development and specification of values stemmed mainly from the results of the second set of interviews. However, data from the other parts of the research was also

taken into account where this fit. To determine the values the approach described by Van Velsen, Wentzel, and Van Gemert-Pijnen (2013) was used. This approach was developed with the CeHRes roadmap in mind and thus fits well for this study. Only those steps relating to the attribute and value development were followed. Firstly, attributes were made based on recurring observations and comments made by participants. As described by Van Velsen et al. (2013), the attributes were "formulated as a very short summary of the end user or stakeholder expression". The second set of interviews was used as the main basis for the development of attributes. However, all outcomes of the other sub-studies were revisited to look for further remarks relating to these attributes, as well as for any additional attributes. Then, the list of attributes was reviewed, to make a categorization of which attributes fit together well. Lastly, the overarching theme for each set of attributes was described in a few words as the value. Contrary to the process that is described by Van Velsen et al. (2013), the process was performed by only one researcher, but discussed with the supervisors.

Results

Five values were determined, with two to six corresponding attributes. An overview of all values and attributes can be found in Table 8.

Firstly, the need for a **low threshold** technology was emphasized. When the barrier of seeking help is perceived as low, it was expected that more students will actually try to receive help in some way. Participants also stressed that use of the technology should not be too difficult or time consuming, so as to not discourage the students. Furthermore, the content needs to **benefit the user**. While students valued the possibility of using different tools that are being offered, the options to contact a professional where necessary was also seen as important. It became apparent during the interviews that the needs and preferences of students can differ. Therefore, **personalized content** that fits the wishes of a particular student is another important value. Participants also reacted enthusiastically to a **positive**

approach to mental health, emphasizing the need for positive design. Lastly, students need to perceive the information they receive as **credible**, and should belief that the technology will help them.

Table 8.

Overview of the values and corresponding attributes per method where they were mentioned.

Value	Attribute	Based on
Low threshold	The information that is provided should be 'to the point'/ concise.	Interview II
	The information should start on a basic level/ with introductory explanations.	Interview II
	The technology should be non-committal and not too time consuming ('Quick & easy').	Interview II
	Signing up/ starting to use the technology should be possible online and without much effort.	Interview I
	The technology should be easily accessible via a laptop (and/ or mobile phone).	Interview II
	The technology should be offered for free.	Interview II
Content that benefits the user	The technology should help the user put their situation into perspective.	Interview I
	The user should be able to gain insight into their own behaviour and stress level.	Focus group
	The technology should provide tools for the user to try out.	Interview II
	The technology should give an overview of useful other technologies.	Interview I
	The technology should enable users to contact a professional.	Focus group
Fit with user	Suggestions should be fitting and personalized for the user.	Interview II
	The information should be relatable/ recognizable for the user (e.g. be presented by a fellow student).	Interview II
	Help should be offered for various causes of stress.	Survey/ Interview I
	A variety of options should be given (e.g. also have the option to help somebody else).	Interview II
Positive design	The design of the technology should be appealing.	Interview II
	The technology should be clearly structured.	Interview II
	The approach of the technology should convey positivity.	Interview II
Proof/ credibility	The added value of the technology should be made obvious to the user.	Interview II
	Actual effectiveness and credibility should be shown to the user.	Interview I/ Interview II

Discussion

The aim of this study was to get an insight into stress and counselling for stress at the UT in order to start the development of a technological intervention. The current counselling process at the UT, involving study advisors and student psychologists was discussed and possible improvements were found mainly in the prevention of stress onset and in making timely and easy counselling more accessible to students. Study advisors and the student psychologists' office are therefore some of the key stakeholders, together with the students themselves. Lastly, based on these results and through the use of several methods, main values for a technology to decrease stress in students were determined. These are offering care with a low threshold, providing content that benefits the user, making the content fit for each individual user, using positive design and providing credible information.

The first value, which was mentioned in several parts of this study, was that the intervention should be provided with a low threshold. This way, those that might not usually seek treatment, for example because of stigmatization, can be reached. Furthermore, online treatment can also act as a 'gateway' for seeking further support in the future, as was found by for example Richards and Tangney (2008) in their study on online communities for student mental health and by Toscos et al. (2018) in a study on tele mental health. This means that the barrier of seeking help in the future is decreased because the student successfully sought help online in the past. Convenience, affordability, accessibility and availability were all seen as reason for students' interest in mental health apps, supporting the idea that students prefer technological interventions that offer care without costing too much time or resources (Kern, Hong, Song, Lipson, & Eisenberg, 2018). This fits with the findings in this study that the threshold of using a technology should be kept as low as possible to reach many students. The use of technology instead of only offering face-to-face counselling was already seen as lowering the threshold by the participants in this study. Additionally, it was

mentioned that easy to follow instructions, and making use of technology that is familiar to the students will help create a lower threshold.

A main goal of any online treatment should be the actual positive effect of the intervention for the user, which relates to the second value that was determined, namely offering content that benefits the user. However, literature is not conclusive on the type of content and way of presenting an intervention that will increase students mental health. While a review of different mental health technologies for students concluded that none of the included interventions for stress reduction (VR interventions, online feedback and psychoeducation) had significant effects (Farrer et al., 2013), others found that online therapy reduced stress in college students (Davies, Morriss, & Glazebrook, 2014), Similarly, in a study by Harrer et al. (2018) positive effects of an online stress treatment were found, compared to a waiting list control group. Interestingly, several of the different aspects of their intervention were also brought up by stakeholders in parts of this research, like the acquisition of knowledge and skills through online lessons, the use of an online diary, being guided by fellow students and the use of positive reinforcement. Thus, these seem to be promising elements for the development of new technology to reduce student stress, and should therefore be implemented in a future prototype.

Another aspect that was frequently mentioned in this research, and that is at the core of the third value, is the need of a technological intervention to fit various target groups, like internationals or first-year students, and to be personalized to the specific needs of each user. This increased attention and demand for personalized eHealth is in line with developments in this field of study (Car, Tan, Huang, Sloot, & Franklin, 2017; Hine, Petersen, Pluke, & Sund, 2008). One way in which this could be achieved is through self-screening, for example by filling in a mental health questionnaire and getting tailored advice based on the given answers. In their study of a web-based self-screening system for referral, Kim, Coumar,

Lober, and Kim (2011) found that the system helped students recognize their mental health issues and also encouraged them to seek professional help. Next to such a referral system, a list of suggestions for other technologies that users can try out could for example be generated by the counselling staff on campus, to make sure that proper tools are presented (Lattie, Lipson, & Eisenberg, 2019).

The fourth value that was determined is the use of positive design elements. Positive design is based on principles of positive psychology and "aims to design for human flourishing" (Zeiner et al., 2018). Positivity in the design of a technology, to which participants in the interviews responded with enthusiasm, can generally have beneficial effects on the well-being of users (Desmet & Pohlmeyer, 2013). Personal fit and active user involvement are mentioned as important aspects of positive design in their research, which fits the outcomes and setup of the current study as user were actively involved early on and stressed the importance of personalized content. Additionally, the promotion of relatedness and interaction between users as well as the facilitation of being able to influence others, like for example by posting on a blog or forum, are mentioned as principles of positive design by Zhang (2007). Similarly, Tolan, Ross, Arkin, Godine, and Clark (2016) found that 'engagement with others' and 'societal bonding' are overarching concepts in the positive development research. Thus, some important elements of positive design were included already in the ideas brought up by participants of the study. By incorporating positive design, positive emotional experiences can be increased, which in turn can lead to more optimism and higher levels of resilience, amongst other things (Burmester, Zeiner, Laib, Hermosa Perrino, & Queßeleit, 2015). This underlines that a positive approach should be taken in the technology development.

Lastly, proof or credibility of information was important to the participants, and was therefore added as a value. Research has found that students have difficulty identifying

credible information online (Donald, 2016; McGrew, Breakstone, Ortega, Smith, & Wineburg, 2018). Suggestions for making online information more credible are to offer verification for sources and to make use of comprehensible language (Thon & Jucks, 2017). Other important aspects in the evaluation of mental health information are style and content related factors (Rowley, Johnson, & Sbaffi, 2015). Therefore, special attention should be paid to make sure that reliable and accurate information is provided in an 'easy to use' way. This was also underlined in one of the interviews, were a study advisor mentioned that the way an intervention is presented matters a lot, as students might not believe in something that they perceive to be 'floaty' or unnecessary.

While these are separate values, it is important to incorporate and combine them well. The content that is developed should be targeted to the needs of the user. Similarly, the technology should be easy to use and accessible without losing credibility. Therefore, the interplay between values needs to be taken into account in the later stages of the development. Furthermore, the values form only a small part of the outcomes of this study, and other aspects like the ideas that were brought up by the stakeholders and the suggested focus for the technology should not be neglected in the development of the technology.

Strengths and limitations

The way that this research has combined a variety of methods and included several relevant stakeholders is one of the main strengths of the current study. The combination of desk research, a questionnaire, interviews and focus groups allowed for a broad foundation that could in turn be used for the development of scenarios and requirements. The desk research provided a good introduction into the topic and factors that play a role in student stress. In the survey and first set of interviews this knowledge was supplemented with specific information from the UT counselling staff. Then, the students' opinion was heard, both in more in-depth interviews and in focus groups, where students had the chance to discuss with each other and

add to each other ideas.

The choice of starting with a general desk research to get an overview of the situation and offered possibilities at the UT made sure that the correct stakeholders would be included later on. This way both the study advisors and the student psychologists' office, as well as students themselves, were able to give their input and thereby benefit the outcomes of this study. Otherwise, a technology might have been developed that would be useful neither to students nor to the counselling staff and use of the technology would be low.

During the interviews it became clear that while the study advisors and the student psychologists' office had a slightly different perspective on some of the topics, the general picture that they perceived was very similar. Therefore, a good basis was given for the further research, as the counselling staff was able to advise on possible target groups and intervention possibilities. During the focus groups it became apparent that the situations that had been described by the counselling staff and that were translated into scenario's were indeed recognizable for the students, emphasizing that the context of student stress had been adequately researched and described. While the survey and interviews gave a good impression of the situation at the UT, there was overlap between the information that was given, and what was mentioned in literature. However, while the survey and interviews might not have been necessary to gather all of the information, it was good to still get in contact with the counselling staff to get them involved in the project.

The focus groups and student interviews that were carried out gave an insight into the student perspective, as they are likely to be the main stakeholder of any future intervention. The participants in both studies varied in age, gender, nationality, study program and phase of study. This ensured that different perspectives were taken into account. Furthermore, most of the students that took part in either of the studies fit within one or more of the possible at-risk groups that were named in the earlier interviews, ensuring that the opinion of the target group

for the to be developed intervention was heard. Including the students at this point of the study allowed for an evaluation of what had been mentioned by the counselling staff. The students were able to see whether they agreed with the main aims and target groups that had been set, which they did. Had this not been the case, the early inclusion of students in the process would have allowed for changes in the aims of the project. It is therefore advisable to include stakeholders in early stages of the development process.

By making use of example technologies in the second set of interviews, participants were able to get an idea of what might be possible without the need of developing a prototype beforehand. This saved time and resources, as there were so many different ideas that developing a prototype for each would have been a lot of work, without being sure whether participants would appreciate the idea.

Lastly, the iterative character of this study is one of its big strengths. Each method evaluated what was done before in a different setting and with different participants. This way, any wrong assumptions and conclusions from previous research could have been ruled out in a next step, and revised if necessary. The fact that there was not much discrepancy between the first results and what was discussed in the next stage underlines that this study has succeeded in giving a good overview of the context and needs of stressed students.

With a total of 16 participants in the focus group and 18 in the interviews, only 34 out of the approximately 10.000 students at the University of Twente have given input for this research. More participants should be included during the further process to verify that the technology that is being developed fits with the wishes and needs of the general student population, for example by evaluating the determined values with them. However, as this research was meant to give a first look at the situation at the UT, and regarding the qualitative approach of the study, the small sample size does not discredit the results that were found.

In both the focus groups and the interviews, there were more female than male

participants. Furthermore, a lot of the participants were first-years and of the international students that were included, most were German. This is partially based on sampling bias as participants were recruited via the SONA subject pool, where mainly first year students of psychology and communication science are registered. However, other participants were approached and recruited to balance the sample, meaning that the aim of the convenience sampling was to include more male non-psychology students. This way, not only the opinion of a select group of students was taken into account. Still, it is crucial for further research to include a broader range of participants to ensure support for the technological intervention from different groups within the student population at the University of Twente.

Future research

This research concluded the first two phases of the CeHRes roadmap, contextual inquiry and value specification. The next step in this framework is the design of the new technology. Based on the values that were determined in this study, a prototype should be developed and tested. Furthermore, the roadmap indicates that attention should be paid to the implementation of the product early on in the process. Therefore, it is also recommendable to develop an implementation strategy or business plan.

Both this study and previous research show that many students that struggle with their mental health do not seek help (Dyrbye et al., 2015). Studies have identified some of the reasons for this behaviour, for example that students are unaware of or unfamiliar with the services that are being offered, (Eisenberg, Golberstein, & Gollust, 2007), that they perceive the stigma around seeking treatment for mental health as too high (Chew-Graham, Rogers, & Yassin, 2003; Eisenberg, Downs, Golberstein, & Zivin, 2009) or that they are unable to recognize symptoms of lower mental health (Gulliver, Griffiths, & Christensen, 2010). However, while some suggestions are given, like increasing mental health literacy or starting promotion campaigns for the health services offered by the university, little is known about

effective ways to tackle these issues. Therefore, it would be beneficial to investigate how such campaigns need to be set up in order to work, and to see whether they are actually able to increase the level of help seeking in students.

In this study, blogs were seen as a means of stress prevention and helping students deal with their stress. However, it has not yet been studies whether blogs can actually fulfil those tasks. In research, blogs have mainly been used as a means of data collection, with some exceptions like case studies or using blogs to test the perceived credibility of information (Wilson, Kenny, & Dickson-Swift, 2015). The effects of blogging for those that write the blogs has also been researched (Barak & Grohol, 2011; Sundar, Edwards, Hu, & Stavrositu, 2007). However, data on the effects of reading a blog is lacking and should therefore be investigated in future research. An example could be whether reading a blog actually has an impact on a person's perceived stress level.

A set of attributes and values was determined based on the results of this study. However, these values have not yet been evaluated with stakeholders to see whether they agree. After such an iteration has taken place, resulting in a set of values that are endorsed by stakeholders, the next steps in the development process can be taken. Based on the attributes and values, requirements for the technology can be developed (Van Velsen et al., 2013). These requirements can then be used first to make a prototype and later for the actual development of the technology.

Lastly, this study has mainly focussed on student stress. However, there are other mental health related problems that many students face, like depression (Ibrahim, Kelly, Adams, & Glazebrook, 2013), anxiety (Beiter et al., 2015) or sleep problems (Gaultney, 2010). However, there might be different needs and values related to these problems. Ideally, a technology could encompass many different mental health topics and that way offer help to as many students as possible. But for now more research is needed into specific contexts and

values, and into the integration of the different topics into one technology. Participants should still be able to find the fitting information for their situation easily and quickly, as the value 'low threshold' underlines. This can be complicated by the inclusion of additional topics.

Conclusion

The present study shows that there is a need for the development of a technology to decrease stress in students at the University of Twente. There are several important points that need to be taken into account in the next steps of the process. Firstly, both students and counsellors find it important that the technology is easily accessible to students, and does not increase the barrier around seeking help because of stigmatization. Furthermore, the content that is offered should be useful for the students and personalization to ensure a good fit between he technology and the user is very important. A positive design approach can make the technology more attractive to students. Lastly, the offered information needs to be credible, and should be presented in a way that the students also perceived as credible. Taking these values into account can increase the chance of successful implementation of the to be developed technology in the UT community.

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Appendix A – Survey questions

My name is Kira Oberschmidt and for my master thesis I am researching burnout in students, which is also why I am contacting you. Would you be so kind to shortly answer the questions below with regards to burnout in your program? You can send me back your answers as a reply to this email. If there are any questions, please let me know. Thanks a lot!

Are there students with burnout or related problems that visit you?

How often does this happen?

What is the cause of these problems?

Depending on the results of this short survey I will probably be planning some short interviews to gather more information on the subject. Would you be willing to participate in a short interview?

Appendix B – Interview scheme

Inleiding

Mijn naam is Kira Oberschmidt en in het kader van mijn masterthesis doe ik onderzoek naar burn-out bij studenten. Om dit probleem in kaart te brengen neem ik een aantal interviews af. Op dit moment ben ik er vooral me bezig te bepalen op welke doelgroep en welk deel van het (behandel)traject ik me het beste kan gaan richten. Ik denk dat u hier meer overzicht over hebt en ben geïnteresseerd in uw zicht hierop.

Ik zou dit interview graag willen opnemen. Hiervan zal een anoniem transcript gemaakt worden, en daarna zal de opnamen worden verwijderd. In mijn thesis zal ik geen namen gaan noemen of aan uitspraken gaan koppelen. Dit staat ook nogmaals uitgelegd in dit informed consentformulier, dat ik u nu wil vragen door te lezen en te tekenen.

Het interview zal beginnen met een aantal vragen over de context/ achtergrond van de problematiek, daarna zullen we gaan kijken naar de verschillende fases van het proces voor een student met burn-out die hier komt. Per fase wil ik graag kijken naar wat er goed gaat, wat er beter kan en welke doelgroepen het meest relevant zijn. Ten slotte ben ik benieuwd wat er volgens u belangrijke onderdelen zouden zijn van een mogelijk technologisch hulpmiddel.

Als u geen vragen meer hebt dan gaan we nu beginnen met het interview.

Achtergrond

Hoe groot is de problematiek van burn-out klachten bij studenten volgens uw inschatting?

- Is dit veranderd de afgelopen jaren?

Wat zijn mogelijke oorzaken hiervan?

- Zijn er verschillende opvallende kenmerken/ risicogroepen?

(Kunnen zij dit zeggen, of anders wellicht anoniem online opvragen?)

Zou u voor mij het proces kunnen schetsen dat een student doorloopt die burn-out klachten heeft?

(Stappen opschrijven op papier)

Proces

Nu zou ik graag per fase willen kijken naar

- Wat er goed gaat
- Wat er minder goed gaat (verbeterd zou kunnen worden)
- Wie de meest belangrijke doelgroep in dit geval zou zijn
- Zijn er (naar uw weten) technische oplossingen, worden deze gebruikt?

Eigen idee: Pre-stadium; aanmelding; intake; behandeling; afsluiting/follow-up

Waarden/ kenmerken

Welke fase en doelgroep zouden naar uw mening de meeste baat hebben bij een nieuwe technologische interventie?

Wat zou er daarvoor nodig zijn?

Eerst heel algemeen, dan:

- Preventief vs. Behandeling
- Onderwerpen
- Specifieke oefeningen
- Duur
- Aanmelding voor deelname

Zijn er nog algemene opmerkingen/ dingen die u wilt toevoegen?

Bedankt voor uw deelname aan dit interview. Wilt u geïnformeerd worden over de resultaten?

Appendix C – Focus group questions

General questions:

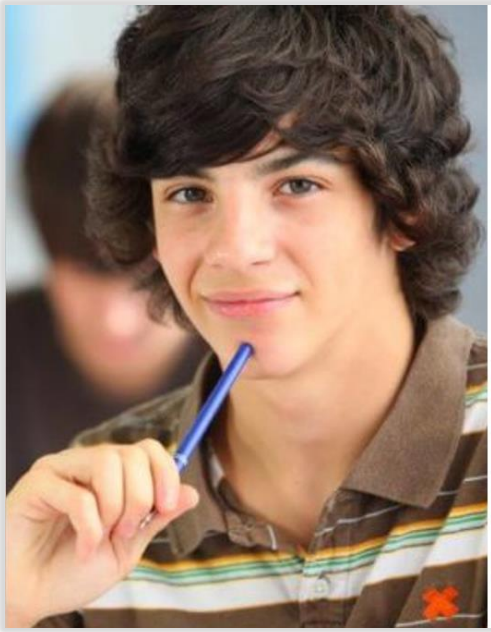
- How do you recognize stress in yourself and in others?
- What would you do when you are stressed?
- Do you think technology could help you answer (one of) those questions? How?

Questions per scenario:

- What sort of technology would you propose in this case? What should it do?
- Should the technology suggest or include exercises? (think back to the things we discussed earlier)
    - Which?
    - When?
- Should the app measure/ save any data?
    - E.g. physiological, preferred exercise, location, monitor level of stress e.g. with the questionnaire you filled out…
- Should there be a possibility to contact a professional?
- What should the technology look like?
    - Medium
    - Design
    - Layout

Appendix D – Scenario's

Scenario 1 – Jan



Case 1

- Jan, 18 years old
- 1st year student mechanical engineering
- Moved to Enschede but has difficulty getting used to living away from his family
- Was a straight A student in high school but now he is not getting top grades anymore and needs to do a resit of an exam
- Wants to make the most of his student life so he joined a student association, does committee work with his study association and became a member of the hockey club

Scenario 2 – Riya

Case 2

- Riya, 21 years old, from India
- 2nd year student biomedical engineering
- Studies funded by Holland scholarship
- Does not understand Dutch and has difficulty adapting to the different culture
- Works hard for her studies, also in the evening and on weekends, therefore she does not have a lot of time to meet with friends
- She feels like all the people around her don't have to work as hard as her, so she does not dare open up to them

Scenario 3 – Marloes

Appendix E – Interview scheme

Introduction/ demographics:

This interview is part of a master's graduation project about technology to decrease stress in students. [Explain structure of the interview.] Ask about age, gender, study program & progress, nationality

Information channels

I want to start with a discussion of different information channels at the UT and in this case specifically channels where you might find information about mental health and counselling at the UT.

From which of these channels are you most likely to receive mental health information (and follow up on that?)

- For example: study advisors, student psychologist, mentors, study associations, social media (e.g. of the UT), website of the UT, Canvas, friends, teachers, student dean, student portal

In what way would you want to receive this information?

- For example: General message/ post, personal message, lecture talk, one-on-one talk, mental health ambassadors/ buddies (like KU Leuven), information on website

How should an intervention be presented to you?

- For example: Website, blog, forum, video's/ vlog, app, test/ survey, game, chat,

Examples of technology

From previous research I gathered several at-risk groups for stress or even burnout in students as well as possible solutions to tackle this. In the next part I want to present you with some situations and examples of technological interventions that might help the person in this case. I would like you to tell me everything that goes through your mind about this specific idea. It does not matter whether it is about the content or the design or whether it is a big or small remark. Even though these are all existing technologies and you might know some of them try to think a bit further, is there anything that is include that is unnecessary for you? Or did they forget something that you find very useful?

Target	Solution	Example
International	Perspective	Student minds blog
Activism	Exercises	Headspace/ Minddistrict
Graduating	Reflection/ feedback	Five Minute Journal/ Alternate Version of a stress test
Freshmen	Organizing tool	Google tasks/ Wunderlist
Mindset/ perfectionism	Links to study advisor/ professional	Mindmates

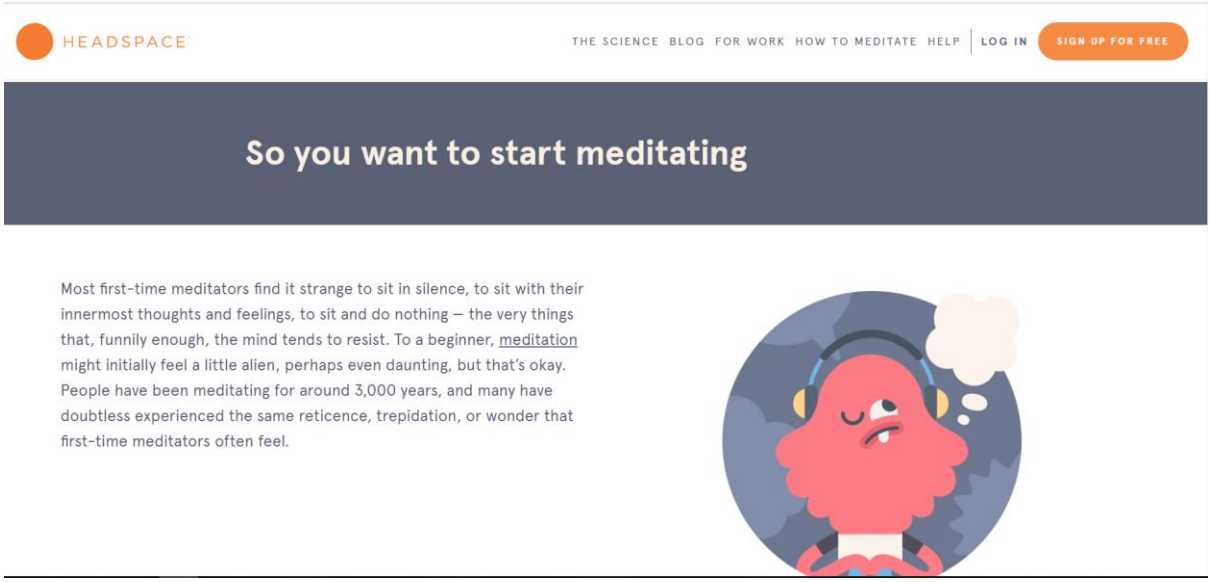
International student

Imagine an international student that has trouble with his mental health. Something that might help him is a blog where others share their experiences and coping strategies for the same situation as his. The idea is to show the student that he is not alone and that others feel the same way. https://www.studentminds.org.uk/yearabroad.html

http://studentmindsorg.blogspot.com/2019/03/how-i-keep-my-mind-happy-on-year-abroad.html

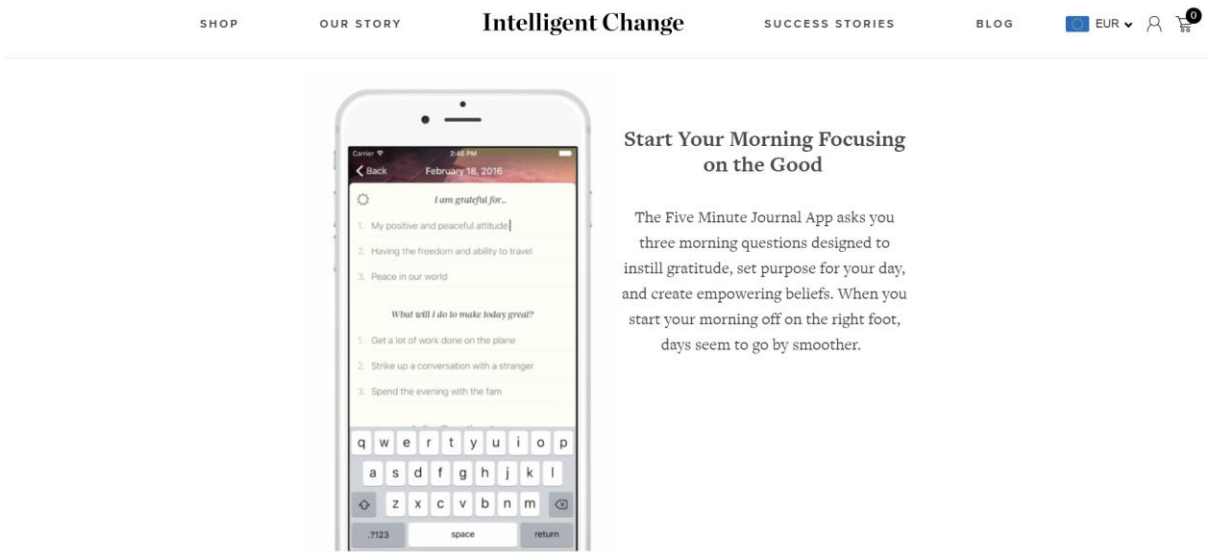
Activism

Some students take on a lot and for example participate in a lot of committees, associations and boards. It can be tricky to relax when you have so many things to do. The idea is to give them short exercises to calm them down when they are feeling overwhelmed with stress. https://www.headspace.com/meditation/meditation-for-beginners



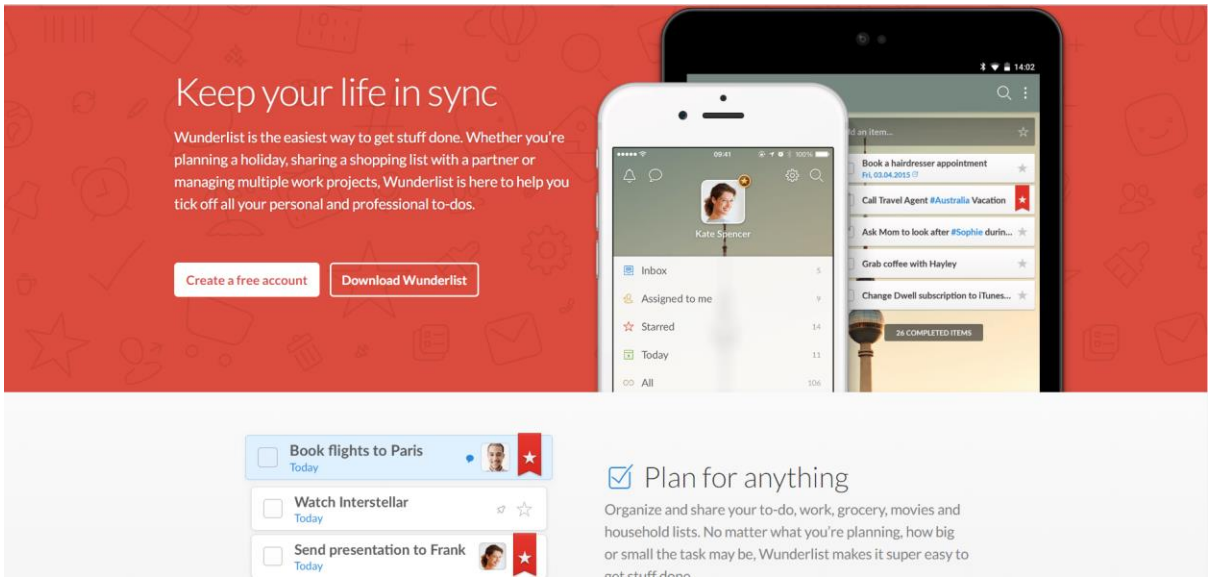
Graduating

Many students get stressed while working on their graduation project. Oftentimes, not only the stress of the project but also the insecurity of what will come after graduation is difficult for them. The idea is to give them more insight into their own situation, wishes and needs through short daily reflections/ *through a 'stress test' that shows that their feelings are normal.* https://www.intelligentchange.com/pages/five-minute-journal-app?utm_source=zapier.com&utm_medium=referral&utm_campaign=zapier



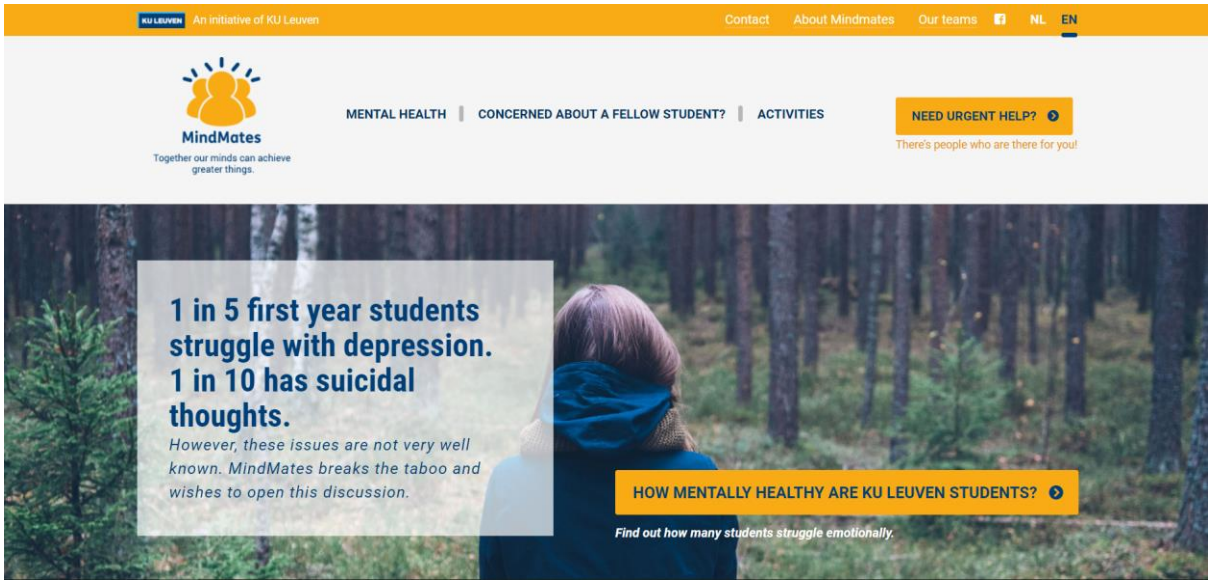
Freshmen

As a new student at the University a lot of things are different than at High School. A new environment, living away from parents and friends, but especially the new type of classes and exams make this a stressful time. An idea on how to support freshmen students is to give them an organizing tool that brings structure into the chaos of new classes and subjects. https://www.wunderlist.com/?ncr=1



Mindset/ perfectionism

A common problem for students is their own mindset. Perfectionism and fear of making mistakes are very common. This can be very difficult to deal with on your own, but on the other hand it is not always easy to step up to somebody and talk about is, especially not a 'official' or 'professional'. The idea of a buddy system is that you have a friend that you can contact, but who is trained to help you with some mental health questions.
https://www.mindmates.be/nl



General values

Looking at everything we discussed: What do you think would be most important in general? How would your ideal technology for stress in students look like?

Rounding up

Thank you for your participation in this study. Do you have any further questions/ remarks?