University of Twente

Bachelor Thesis

Customisation in E-(mental) health

Author:

Ineke Sophie Smits

Coordinators:

Tessa Dekkers &

Peter ten Klooster

Department of Positive Psychology and Technology

BMS faculty

Table of Contents

Abstract

Background The digital healthcare sector has become an essential segment in the treatment of illnesses and the promotion of well-being. Still, attrition rates when using pertinent apps are high, bearing the consequence that the usefulness of e-health interventions in terms of health behaviour change is called into question. However, research in a variety of contexts has shown that customisable features in e-health interventions can combat attrition rates.

This research project has explored the perceived effects of customisation on users' intrinsic motivation for long-term usage. For this purpose, the e-mental health mobile application *MoodMission* was selected as technical basis of a case study since it has customisable features.

Method This study employed a mixed-method approach in order to get a deeper understanding of the perceived role of customisation on user-engagement and mental health. Ten participants were asked to use *MoodMission* for 14 days. Before and after participants used the app, they were requested to fill in two online questionnaires, the General Anxiety Disorder-Scale 7 (GAD-7) and the Warwick-Edinburgh Mental-Well-being Scale (WEMWBS). Subsequently, interviews with participants were conducted exploring the perceived effects of customisation on users' intrinsic motivation to engage with the app from the perspective of the Self-Determination Theory (SDT). These interviews were analysed by using a framework approach.

Results The results of the qualitative analysis revealed that the feature of customisation in *MoodMission* did not have an influence on volitional user engagement from the participants perspective. Participants mentioned *main themes* which were connected to meeting the need for competence and the need for autonomy. Yet, meeting the need for relatedness was not expressed by the participants. This finding was perceived to have influenced their intrinsic motivation to engage with the app. Consequently, most users stopped using the app.

With regard to the quantitative data analysis, a dependent t-test showed both a non-significant change of well-being and anxiety.

Conclusion As the overall result (no effects of customisation) seems to be widely linked to the specifics of *MoodMission*, further studies will be needed in order to overcome remediable defects as being present in *MoodMission* when it comes to customization. The author proposes to engage more intensively and with more participants into the exploration of persuasive strategies that can be considered to intrinsically motivate individuals to engage with e-mental health mobile applications over a long-term period.

1. Introduction

Electronic health (eHealth) is a rapidly growing field in the digital healthcare sector and appears to have great potential to support health promotion (Jiménez & Bregenzer, 2018). Health promotion is according to the World Health Organization defined as "the process of enabling people to increase control over, and to improve their health" (World Health Organization, 1998). The notion of health means the "highest attainable standard of (physical and) mental health" in relation to a specific person (International Covenant on Economic, Social and Cultural, 1987, p. 279).

At present, a considerable amount of eHealth interventions is available in the various areas of health promotion, including websites or mobile applications that focus on improving physical and mental health (Jiménez et al., 2017). Such mental health services, delivered through the internet and related technologies, are called e-mental health (Christensen, Griffiths, & Evans, 2002). Examples of e-mental health mobile applications include the meditation app *Headspace* (Carlo, Ghomi, Renn, & Areán, 2019) and *Sanvello* (One Mind Psyberguide, 2020). *Headspace* offers mindfulness meditation exercises to support users by reducing feelings of tensions and distress (Headspace, 2020). The second, called *Sanvello*, is known for its high rated user-experience profile. *Sanvello* provides users with cognitive behavioural strategies in order to reduce symptoms of anxiety, depression and stress (One Mind Psyberguide, 2020).

Despite the large number of e-mental health applications, there is much criticism as far as their quality is concerned (Bol, Høie, Nguyen, & Smit, 2019). One major objection is their effectiveness, because the instruments available today only have a slight to modest influence on the improvement of health, which, among other things, is caused by attrition (Bol et al., 2019; Mispel, Poppe, Crombez, Verloigne, & Bourdeaudhuij, 2017).The average attrition rate among e-health treatments for psychological conditions range from 23-64% (Linardon & Fuller-Tyszkiewicz,2020). Attrition occurs when individuals discontinue the usage of e-Health technology (Mispel et al., 2017). One of the most common types of attrition is the type of "nonusage attrition". This form of attrition can appear at any time, for instance, when individuals do not finish a session or when they do not pay attention to the existence of the application anymore (Mispel et al., 2017). To this day, the motives for attrition are not fully understood. However, it is expected that a lack of motivation contributes to the non-adherence (Vaghefi & Tulu, 2019). This lack of motivation might be improved by adding the factor of customisation in these e-Health applications. However, the value of customisation for reducing attrition in e-mobile health applications has rarely been investigated. The current study explores the role of customisation in improving intrinsic motivation to use eHealth interventions that aim to improve mental health.

1.1 Customisation in health and e-health

1.1.1 The concept of "customisation" and its distinction from "personalisation"

The idea of providing customised and personalised products and services to consumers is not new. In fact, advertising marketers have recognised the enormous potential of media fragmentation in media contexts at an early stage (Kalyanaraman & Sundar, 2006). Eventually, media fragmentation has the advantage of attracting certain consumers by giving them the opportunity to choose between different channels.

Also in the context of health communication it quickly became apparent that, for instance, health educational materials which often were composed of mass-produced literature designed for a broad population might not be appropriate for everyone as it does not address the personal demands and interests of the unique individual (Kalyanaraman & Sundar, 2006). Here, tailoring of products and services provides an opportunity to adapt them to the various needs of customers by aiming at the individual user (Kalyanaraman & Sundar, 2006). Two tailoring strategies are commonly employed to adapt to users' needs and to foster volitional engagement - *system-initiated personalisation* (SIP) as a traditional tailoring method and *user-initiated customisation* (UIC).

In the SIP, the personalised output is offered by the system through automatic user-information gathering. The data obtained are saved in overt and covert ways. The former systems gather information about the user by directly asking the user for their data. In contrast, the latter system stores, and analyses user web-behaviour by placing cookies in order to adjust websites as well as their contents to the user's preferences and demands (Sundar & Marathe, 2010).

On the contrary, UIC refers to the empowerment of an individual using a device to self-tailor information in order to meet his or her specific preferences and needs as being based on the identification of distinctive characteristics (Kreuter, 2000, as cited in Kalyanaraman, & Sundar, 2006). Ultimately, customised devices give customers the freedom to adjust the content and features of a particular device to their personal preferences directly and thereby provide them with an active role (Bol et al., 2019).

1.1.2 Advantages of customisation

Customisation may improve the effectiveness of behaviour change interventions by increasing perceptions of agency. According to the agency model (Bang, & Ragnemalm, 2012), customisation is intended to give users a strong sense of personal agency to act by permanently enabling them to create their own contents based on their individual preferences and demands. This model assumes that activating the "self-as-a-source schema" results in a cognitive and attitudinal

change (Sundar & Marathe, 2010). The cognitive change will lead to greater motivation for usage that will ultimately lead to better engagement. This engagement will in turn lead to an attitudinal change by developing a positive attitude towards the content. This, eventually, may evoke a greater sense of the self-displayed in the content (Sundar & Marathe, 2010). Similarly, Kang et al. (2017) argue that giving individuals an active role and control over the creation of customised products according to their demands leads, on the one hand, to the projection of one's identity onto a given product and, on the other hand, allows the self-controlling user to monitor how the technology operates (Kang & Sundar, 2016; Kang et al., 2017). This control is perceived as appealing for the user and ultimately allows him or her to build a deep emotional connection with the health tool which then may lead to a greater intrinsic motivation for the continuation of usage (Kang et al., 2017). In line with the concepts of agency and self, customisation is "best understood as the degree to which the self feels like s/he is a relevant actor in online interactions, or as a sense of involvement, identity and control, thereby enhancing their efficacy and self-determination in that domain" (Bang & Ragnemalm, 2012, p.118). Accordingly, self-determination is a crucial factor that contributes to intrinsic human motivation for the long-term use of a health application and success in terms of health.

1.1.3 Significance of the self-determination theory

Since self-determination (Ryan & Deci, 2000) is of crucial importance for the stimulation and maintenance of motivation, it appears necessary to define it with special regard to its relevance for customisation. According to the self-determination theory (SDT) on human motivation, the type of motivation is more relevant than the amount of motivation for an individual being proactive and engaged. Regarding the type of motivation intrinsic motivation and extrinsic motivation must be distinguished from each other. *Intrinsic motivation,* also referred to as "autonomous motivation", describes what an individual is doing when feeling a full sense of interest, enjoyment, and inherent satisfaction. Whatever the activity may be, the individual has a real sense of interest, pure joy and attaches high value to it (Ryan & Deci, 2000). In contrast, *extrinsic motivation* refers to an external stimulus, e.g., obtaining reward or avoiding punishment. In short, individuals feel pressured, demanded, or obliged to do a particular activity. Whereas extrinsic motivation declines as soon as the pertinent stimulus stops, intrinsic motivation renews itself through the individual and is therefore more sustainable (Ryan & Deci, 2000). The crucial question is therefore which factors contribute to intrinsic motivation. According to the SDT it depends on a set of universal psychological needs that are common to all human beings. These include the need for competence, the need for relatedness and the need for autonomy. The need for competence involves feeling confident and effective with

regard to the environment. The need for relatedness comprises the need to feel cared for and be needed by other people. Here, the feeling of belonging and social inclusion is paramount. Last but not least, the need for autonomy implies the self-initiation and self-regulation of the individual's behaviour. When all needs are met, individuals feel intrinsically motivated (Ryan & Deci, 2000).

1.1.4 Evidence-based success reports on the effectiveness of customisation

As shown above, the customisation might have a significant influence on the user's intrinsic motivation to use an e-health intervention over a long period of time and thereby enhances the chances to increase the individual's health (Bol et al., 2018). Evidence for the positive impact of customisation is provided by the study of Bol et al., 2018, who examined the effect of self-tailoring the mode of information presentation on younger and older adults' satisfaction with health websites. They found that giving the user the ability to self-tailor the modality of information presentation based on visual and auditory capabilities led to an increase of satisfaction in health website usage, specifically for individuals with a high need for autonomy (Bol et al., 2018).

Furthermore, the study of McCall, Richardson, Helgadottir and Chen (2018) dealt with the topic of social anxiety disorder among non-clinical university students. While establishing a web-based intervention called "Overcome Social Anxiety", the researchers investigated whether their eHealth intervention is effective in alleviating social anxiety symptoms and, in parallel to this, to what extent their program might improve life satisfaction (McCall, Richardson, Helgadottir, & Chen, 2018). Their findings suggest that customized output resulted in a significant attenuation of the social anxiety symptoms and a slight increase in life satisfaction (McCall et al., 2018).

Scientific research thus supports certain positive effects of customisation. However, there is a lack of research on the value of customisation for e-mental health mobile applications. This study will follow on from this research and, like the study of McCall et al., will focus on the role of customisation in mental health apps on symptoms of general anxiety disorder in the general population and their general well-being.

1.1.5 General Anxiety Disorder as a promising field of application

General Anxiety Disorder (GAD) is a prevalent disorder that is characterised by pathological worrying about future events (Davey, 2014). Davey (2014) has described that individuals suffering from this condition often experience persisting apprehension and anxiety accompanied by symptoms of restlessness, agitation, and muscle tension. Furthermore, individuals diagnosed with GAD often show considerable impairments in psychological functioning, role

functioning and labour productivity. Moreover, their health-related quality of life due to this condition is significantly decreased.

There is good evidence that structured psychological therapy, such as cognitive behavioural therapy is effective in treating the disorder (Davey, 2014). This is because various psychological theories propose that cognitive bias and dysfunctional beliefs about the function of worrying may be paramount to the development and preservation of GAD. Employing CBT for the treatment of the disorder involves several components such as self-monitoring, relaxation training, cognitive reframing, and behavioural rehearsal (Davey, 2014). However, there are not enough psychotherapists available who may guide individuals through the curing process (Berg, Shapiro, Bickerstaffe, & Cavanagh, 2004). This lack of psychotherapists requires new innovative ideas to help the general population to cope with the disorder outside of traditional therapeutic settings. Mobile e-health applications might have the potential to support individuals with mental health complaints during waitlist for regular therapy.

MoodMission, a customised e-mental health app may provide an effective solution for improving public health. It provides users with cognitive behavioural strategies to improve their confidence in the ability cope with low moods, distress, and anxieties.

Ultimately, this research will explore the experiences with customisation in the app *MoodMission* in relation to intrinsic motivation to engage with the app. Additionally, it will be investigated whether symptoms of general anxiety disorder in the general population decrease and, respectively, whether general well-being increases after a 14 days period of usage.

Research Questions:

1. What is the perceived effect of customisation on users' intrinsic motivation to engage with the app *MoodMission*?
2. What is the perceived effect of customisation in relation to attrition, well-being, and symptoms of generalized anxiety disorder?

2. Methods

2.1 Design

The study aims to investigate whether customisation has a positive impact on user intrinsic motivation, mental well-being, and generalised anxiety. In order to answer this question, a specific e-mental health app was selected as an example, on the basis of which the practical experience of users could be examined. This is the application *MoodMission* (Bakker & Rickard, 2019).

A sequential exploratory design, a typology of mixed method designs was conducted (Bishop, 2015), by combining both qualitative and quantitative research. This design was used because the first aim was to explore participants experiences with customisation in *MoodMission* qualitatively and the secondary aim was to assess the effects of *MoodMission* on mental health quantitatively.

This research project was reviewed, assessed, and approved by the BMS Ethics Committee of the University of Twente (reference number 200384).

2.2 Participants

A total of 13 participants were invited to provide feedback about the short-term effectiveness and their experience with the mobile application called *MoodMission* (Bakker & Rickard, 2019). For the selection of participants, a convenience sampling method was used according to which the experimenter asked family members, a close circle of friends and fellow students to participate in the study.

In total, ten participants (N= 10), consisting of three men and seven women responded and participated in the study. The participants' ages ranged from 22 to 57, with an average age of 32.4. Participants who joined the study resided in Germany (N=8, 80%) and Denmark (N=2, 20%). The majority of participants had attained lower levels of education, such as high school graduate degree 70% (N=7) and the minority had attained higher levels of education, such as a master's degree 30% (N=3).

None of the participants suffered from mental health problems, which means that they were not diagnosed with severe mental illness, including depression, anxiety disorder, psychotic disorder, and substance use disorders. Moreover, all the participants were familiar with modern technology in the sense that they were able to use a smartphone including mobile applications.

2.3 Materials

2.3.1 MoodMission

The *MoodMission* application was distributed to participants and used for a period of fourteen days. *MoodMission* is a mobile health app developed in Australia that serves the purpose of preventing and coping with low levels of clinically relevant symptoms of generalised anxiety disorder as well as signs of depression. The app was designed as a supplement to conventional face-to-face cognitive behavioural therapy. It provides the user with self-help strategies aiming at the reduction of feelings of anxiety and depression (Bakker et al., 2018). Whenever the user opens the app, (s)he is confronted with a question concerning the feeling at this very moment, which can be answered with "low, flat or depressed", or "anxious, nervous or worried", or "I'm not feeling either of the above". Followed with missions that are tailored to the specific selection criteria. This initial question serves the purpose of producing an "adaptive learning algorithm" (Bakker & Rickard, 2019), which primarily aims at providing the user with missions that are personally preferred. After replying to the question, the user should pick an option that best describes the problem, followed by five strategies called *Missions* that the user can choose from. The selection of missions is the customized component of *MoodMission*. This form of customisation is called by- *alternative customization.* It gives the user the possibility to choose the most preferred option from a series of predefined options (Bleier, Keyser, & Verleye, 2018). The customizable component of *MoodMission* has already been tested in previous research, where it has been shown that the selection of missions is perceived as customizable (Bakker et al, 2018).

These missions are gathered from evidence-based cognitive behavioural therapies, short in duration and easily doable. After repeated usage of the app, the individual user should acquire habitual behaviour that fosters the prevention of low moods and anxieties (Bakker & Rickard, 2019).

2.3.2 Interview guide

The data relating to the participants' experiences with *MoodMission* were collected by conducting a semi-structured interview after the testing period. The framework of the interview was composed of 22 questions. This interview started with the first question: "*What made you decide to join the study?"* In the further process of the interview, questions were narrowed down from more general questions about the app to more specific questions about the intrinsic motivation for the app usage. Following a framework approach (Pope, Ziebland, & Mays, 2000) intrinsic motivation was explored using the concepts of the SDT, including questions about autonomy (*"Did you feel active control over the content of the app?*"), relatedness ("*Did you get the impression the app takes care of*

you? "), and competence ("*Did you feel competent enough to use the app? Why (not)?*"). The interview was concluded with a question about the overall experience with the app (see Appendix C for the complete interview guide).

2.3.4 Questionnaires

The data relating to the effectiveness of the application on mental health were collected by a sequence of two self-report questionnaires, consisting of the General Anxiety Disorder- 7 (GAD-7) (Spitzer, Kroenke, Williams, & Löwe, 2006) and the Warwick-Edinburgh Mental- Well-being Scale (WEMWBS) (Tennant et al., 2007). Both assessment tools were chosen because of their psychometric quality; both questionnaires have a high internal reliability. Moreover, both assessment tools seem to be suitable to measure levels of anxiety and levels of subjective well-being of the general public.

Anxiety**.** The GAD-7 is a 7-item self-evaluation assessment tool used to measure the severity of anxiety symptoms according to the criteria of DSM-IV. The GAD-7 items include nervousness (*"Feeling nervous, anxious, or on edge"*), inability to stop worrying (*"Not being able to stop or control worrying"*), excessive worry ("*Worrying too much about different things"*, restlessness ("*Being so restless that it's hard to sit still"),* difficulty in relaxing (*"Trouble relaxing"),* inclination to irritation ("*Becoming easily annoyed or irritable*"), and fear of something awful happening ("*Feeling afraid as if something awful might happen")* (Spitzer, et al., 2006). Participants are asked how often they have experienced anxiety symptoms in the last two weeks. Items are scored on a 4-point Likert scale, which indicates symptom frequency. Response options include "Not at all" (0), "Several days" (1), "More than half of the days" (2) and "Nearly every day" (3). The responses scores are later summarised ranging from 0 to 21, with higher scores indicating probable cases of generalised anxiety disorder. Scores ranging from 0-4 are interpreted as no/minimum anxiety, 5-9 as mild, 10-14 as moderate, and 15-21 implying severe GAD symptoms. The GAD-7 scale has a high internal reliability, Cronbach's $\alpha = 0.92$ (Spitzer, et al., 2006) (see Appendix a for the complete questionnaire).

Well-being. The WEMWBS is a fourteen-items self-evaluation scale. It was developed in order to measure subjective mental well-being and psychological functioning in adults. Questions cover concepts such as positive mental impacts (*"I've been feeling optimistic about the future"*), good interhuman relations ("*I've been feeling close to other people)* and good mental operations (*"I've been dealing with problems well") (*Tennant et al., 2007). By filling in the scale, respondents are

asked to report how often they had positive psychological experiences over the past two weeks on a five-point -Likert scale. The scale includes response options ranging from “None of the time” (1) to “All of the time” (5). To achieve a total score for well-being, the scores are summed. Respondents could achieve a minimum score of 14 and a maximum score of 70, with higher scores indicating positive mental functioning. The scale has a high internal reliability, with a Cronbach's $\alpha = .91$ (Tennant et al., 2007) (see Appendix B for the complete questionnaire).

2.4 Procedure

Participants were recruited in the personal network of the researcher. After receiving their consent, they were emailed with a link and asked to fill out an online survey on subjective well-being and psychological functioning administered through the online survey tool Qualtrics.

After the completion of the online survey, participants were asked to download the mobile application *MoodMission* and use it over a period of fourteen days. It should be noted here that the participants were not specifically instructed by the researcher how to use the app, since it was a core element of the customisation feature that participants should use the application in any way they would like. After experiencing the mobile app for two weeks, participants were emailed once again with the link to the online survey. They were asked to complete the survey for a second time aiming to measure the effectiveness of the application in terms of mental well-being and levels of generalised anxiety. Following the completion of the online survey participants were debriefed with an online interview about their experience with *MoodMission*. Each interview took about 20minutes and was performed in the German language as well as in the English language. By using a smartphone, the interviews were audio recorded for the preceding data analysis. After the interview, the participants were thanked for their participation.

2.5 Data analysis

2.5.1 Qualitative data analysis

The recorded audio files from the interviews were transcribed into electronic format. Then the transcribed interviews were read freely by the researcher. Afterwards, a deductive content analysis was conducted (Elo & Kyngäs, 2008). The deductive process was divided into four steps. The first step coincided with the preparation step. In this step, the interviews were classified into smaller categories (“themes”) in line with the components of the SDT (need for competence “Did you feel competent enough to use the application?”, need for relatedness “Did you have the impression that the app takes care of you?”, and need for autonomy “Did you feel active control over the content ?”). In the second step quotes of participants were reduced to sub-categories (“sub-themes”), e.g. the

phrase: “An active control over the content...hmm, so I decide in which direction it goes. I can choose which exercise I do.”, was reduced to the sub-theme “choice”. In the third step, it was explored whether there are parallels in the participant’s statements. In the fourth step a categorisation matrix was produced with the primary category “intrinsic motivation”, the generic category “need for autonomy, need for relatedness and need for competence” as well as sub-categories (“themes”).

Moreover, an additional category was created for fragments of the interview that fell outside the components of the SDT.

2.5.2 Quantitative data analysis

In order to determine the effectiveness of the mobile application the dataset of the pre- and post-survey was analysed in IBM SPSS v.26. The first step was to create a box plot to detect and exclude outliers. The second step included the creation of a histogram to check the normality. It should be mentioned here, that because of the small sample size the findings are underpowered for statistical hypothesis testing purposes.

The third and last step was to perform the dependent t-test in order to compare the means of the pre-survey and the post-survey and explore differences in the levels of general anxiety and the levels of well-being pre and post the usage of *MoodMission*.

3. Results

3.1 Qualitative findings

In all interviews, two of the three components of intrinsic motivation were mentioned to be met, namely the need for autonomy and the need for competence. Yet the need for relatedness was not mentioned to be met.

3.1.1 Need for autonomy

While exploring the need for autonomy, participants were asked whether they felt active control over the content and active control over the planning of the activities in the app *MoodMission*. In this process three themes were found, namely *choice, interest, and opposition*. The most frequent theme related to active control was *choice* (N=8). Participants expressed in the interviews that they were able to choose between different missions. This gave them the opportunity to be active and in control. One participant, for example, said: "…. *you have been offered ten solutions from two categories of mood, you have a lot of freedom and scope to choose the right one for you."* (f,28). T*wo distinct source*s produced the perception of choice. Firstly, as explained above, the ability to choose between different missions (choice of contents). Secondly, participants experienced a choice when they were able to determine the point in time they wanted to execute the missions: *"...you could start the app whenever you wanted, morning, evening or lunchtime"* (m,23) (choice of time). Thus, both choices relating to contents and time can be considered as elements of autonomy in mental health application usage.

The second theme related to autonomy was *identification* (N=4). Participants received the impression that the content of the app adapts to their specific interests. One participant said: *"I got more sporty missions since I chose them more often*" (f, 22). Besides that, it appeared that one sub-theme intensified the perception of *identification*, namely *enjoyment*. *"I was really amazed at the choice of possibilities, how it is tailored to me. - As if the app can judge, um, what things I like, what I enjoy and what things I don't enjoy"* (m,57). This quote demonstrated that the user felt a sense of enjoyment regarding the offered mission. In addition, it demonstrated the effect of tailoring because the user felt recognized by the app. It, therefore, seems reasonable to presume that by providing the user with enjoyment and thus with a positive attitude towards the content of the app *MoodMission* can increase the perception of recognition. This positive attitude in term can be assumed to evoke a greater intrinsic motivation for the self-initiation of usage. Hence, *identification* can be regarded as a potential expression of the need for autonomy.

The third theme being identified can be designated as *opposition* (N=4). This theme appeared to contradict the previously mentioned themes relating to autonomy because participants expressed

their lack of control and identification.” *No, I don't think so, because the contents are fixed in the app and are then suggested to me, and to my knowledge I cannot or could not change them”* (m,26). This quote emphasized that the app appeared to offer “missions” in a pre-planned format which cannot be changed by the user. Thus, the program appeared to inhibit the user’s perception to be in control. Regarding the lack of identification, some participants expressed that they did not gain the impression that the app addressed individual problems. *"No, that seemed very standardised to me. It cannot respond to my individual problems, uh, this app can't respond to that in any case, it's ... it's ... it doesn't respond enough to who the individual person is."*(f.55). This quote showed that the individual had not the impression that *MoodMission* customizes usage according to individual demands. As a result, this perceived inability might have inhibited the individual to feel respected as an individual person by the app. Both quotes mentioned concordantly imply serious doubts regarding the exercise of control and the reflection of oneself onto the app. Apparently, they emphasized an oppositional attitude towards *MoodMission* that might have resulted in a prevention of autonomous motivation for the continuation of usage.

3. 1.2 Need for Relatedness

In order to explore the need for relatedness participants were asked if they felt cared for by the app and what the app meant to them. In this process 23 answers about the need for relatedness were given. First of all, it should be mentioned that none of the participants seemed to build any form of attachment towards *MoodMission.* Rather it appeared that participants reduce it to a technical program with no additional value: *“It's just an app and nothing more”* (f,25). Here, the app is reduced to a technical device.

In line with this reduction, it was also apparent that most participants did not feel cared by the app: “*No, it's just an app. I don't think an app like this can take care of a person"* (m,26). This and similar quotes showed that participants perceived the app as *uncaring* (N=9). Three distinct sources contributed to the perception of not feeling cared for by the app, namely *lack of feedback, lack of notification* and *monotone questioning*. In regard to *lack of feedback,* one participant said: *“I didn’t get any positive feedback, none that you did great, or how are you doing today? Nothing happened, and that’s why I don’t have the impression that it cared about anything”* (m, 23). This quote emphasized the need for feedback in order to feel cared for by the app. Positive feedback additionally appeared important to encourage the user to continue using the app. Hence, a lack of (positive) feedback might have resulted in indifference and detachment towards the app. Also, a lack of alerts appears to let the user forget about the app. One participant expressed: *“Well, I can also explain that with the alerts, if these alerts would come, so for example, like »how are you doing right now?«, it would make me feel, ah okay the app is running in the background asking me and so it takes care of*

me" (f, 22). This user experienced the app as uncaring because it did not inquire about the well-being. Furthermore, participants statements gave reason to assume that not sending the individual notification to create the awareness to exist leads the individual to forget about the app. This led to the conclusion that when the app does not promote the feeling to care about the user, the user does not care for the app either.

Another major theme that was found in the interview was the *lack of feelings* towards the app. Instead, participants perceived the app as a "tool": *"It can be a tool for people…, which can help to boost the mood."* Participants justified their lack of feeling on the grounds that a tool is not aimed to evoke feelings. *"I can't get any feelings about it right now. I don't have any feelings for other tools (either)"* (f, 25). Even though participants did not develop feelings for the app, it appeared that those who completed missions experienced positive feelings for oneself: *"And the exercises were good in themselves, they gave positive feelings when I finished them, and they were so implementable"* (f,28). This shows that the app contributed to a sense of self-care, even though it did not meet the need for relatedness. At best, one can conclude that the app indirectly "cares" by evoking positive feelings as a consequence of exercises induced by the app.

Utterances referring to *monotone questions* were found three times. Questions being perceived as monotonous seemed to negatively influence the users as it reduced their scope of feelings. The following example quote demonstrated this proposition: "*The app always asked the same questions, with no additional questions. It didn't ask me independently how I was doing either. There was only the question whether I felt anxious, nervous or depressed...but I have more feelings than these three....however, I was always asked the same questions about the MoodMissions, so in short: I did not get the impression that the app takes care of me*" (f,25). Apparently, this participant felt reduced regarding her/his feelings and, therefore, not cared for. As *MoodMission* failed in providing the participant with the expected diversity of moods, the latter reacted dismissively and offended.

In the end, all three codes, the lack of feedback, the lack of notifications and monotone questioning can be considered elements which undermine the need for relatedness in *MoodMission.* All of these contribute to the impression that the app is *uncaring* while the responses of several people did suggest that they would expect or appreciate this.

3.1.3 Need for competence

While exploring the need for competence participants were asked if they felt competent enough to use the app. In this process it turned out that eight out of ten participants felt competent enough to use the app. They felt competent because they perceived the application as easy-to-use.

For instance one user mentioned: "*So I felt competent enough in any case since the app itself was very easy to use ... also immediately, um, it was recognisable what the app wanted from me…*" (m,26). Apparently, the ease of use contributed to the perception of being effective in regard to the usage of *MoodMission.* Furthermore, it can be derived from the interviews that the ease of use can be divided into three sub-themes including *easy questions, manageable tasks,* and *tasks of short duration*. With respect to the sub-theme of *easy questions,* one participant expressed that the questions are simple: "*...uhm and also always by simple questions and answers respectively by questions"* (m,26). In a pre-planned format, the app only provides one question that refers to the individual's feeling in the moment. Another participant mentioned her surprise about the simplicity of missions: "*-because the tasks were easy to imitate and I always thought that they would have to be more difficult and complex to have an effect on my mood"* (f,28). The last sub-theme comprises the short duration of missions, which should cause a smooth integration in the daily routine. Two participants recognised the short duration of missions: "*Oh and they were quite short..."* (f,22). Eventually, all sub-themes seemed to provide the user with a sense of competence concerning the usage of the app and thus to improve intrinsic motivation. Nonetheless, it should be mentioned that two participants who skipped the guide, experienced difficulties in understanding the application. "*At the beginning not - but I think that is because I skipped the guide at the beginning. In the end, I knew where to click to choose and check a mission. But I am still not quite sure about what the app is able to"* (f,22).

3.1.4 Continued usage

Even though two components of the SDT were found to be present and were generally positively evaluated, seven out of ten participants stopped the usage of the app within or after the testing trial. Ultimately, it appears that the customisable feature in *MoodMission* did not influence user engagement and adherence in usage *"I was told that the experiment is finished and since I don't have a mental disorder ..uhm I have no reason ..uhm to continue using this app .."* (f, 55).

Nevertheless, three participants continued the usage. One participant suffering from anxiousness felt supported by *MoodMission*: "*I think I won't de-install the app immediately, because it helped when I was feeling anxious on one occasion* (f,31). Two participants felt positively influenced by the app: "*It was a positive experience. It was positive because I had all these little feelings of success"* (m,57).

Table 1

Needs mentioned by the participants based on the SDT

Theme	Sub-theme (frequency)	Description of the theme	Example quotes (translated into English)
Need for autonomy	Choice (8) Identification (4) Opposition (4)	Choice of missions and choice of time for execution of missions	*"Yes, you could start the app whenever you wanted - morning, evening or lunchtime. You could do it in the morning if you felt bad or something."*
		Unique preferences of the individual; Enjoyment of app usage	*"Because everything that was offered to me, such as moped screwing or spontaneous showering, I could shower for hours under the hot shower... so it was always to my liking and interest. "*
		Standardisation of the app	*"No, it's an app that asks these tasks or anything else to every other person in the same way and hasn't individualized it now."*
Need for relatedness	Uncaring (9) Feelings (10)	Lack of feedback, lack of alerts and monotone questions	*"Sometimes, I did not finish a mission, and the app didn't ask me to finish it. It just was not interested in that. Not interested in me, that was the way it felt".*
		Lack of feelings in regard to the app	*"So, as I said before, the app is a useful tool, and I don't have any feelings for the app."*
Need for competence	Easy usage (8)	Simplicity of usage Short duration of missions	*"So competent enough in any case, since the app itself was very easy to use ... also immediately, um, was recognisable what the app wanted from me."*
	Short duration (3)		*"I did two missions, which I was able to do in a short time and which seemed to be ok"*

3.2 Quantitative findings

Short-term effects on anxiety and well-being

To test whether the anxiety levels and well-being levels were significantly different before and after the usage of the app *MoodMission* a dependent sample t-test was performed. Although average anxiety scores were slightly lower and average wellbeing scores slightly higher after the usage of the app *MoodMission*, these differences were not significant (well-being: t (9) = -.077, p =.940; anxiety: t (9)= 0.751, p= .472) (see Appendix D for raw data).

Table 2

Contrast of well-being and symptoms of anxiety before and after the usage period of MoodMission

	Pre-test		Post-test	
Variable	M	SD	M	SD
Anxiety	14.00	5.14	12.9	2.60
Well-being	46.7	10.0	47.0	8.0

4. Discussion

This research project had two central research objectives. First of all, it aimed at exploring the perceived effect of customisation on user's intrinsic motivation to engage with a mobile e-health application. Secondly, it tried to investigate whether customisation could be an appropriate strategy for avoiding the discontinuation of the application use from the participants perspective. Besides, it was explored whether a customised app could be effective in both decreasing symptoms of a general anxiety disorder (GAD) and increasing well-being in the general population. For these purposes, the mobile e-health application *MoodMission* was taken into consideration. The customised component of *MoodMission* entails the selection of missions (Bakker et al., 2018). While using the app, the user is encouraged to input their current experience of distress. Based on this input the app presents the user a tailored list of coping activities, called *Missions*, which the user can choose from. (Bakker et al., 2018). The results of this study indicated that even though participants had a central role concerning the determination of missions, they had not expressed volitional engagement. Actually, seven out of ten non-clinical participants stopped using the app right after the trial phase or even within it. Hence, the findings suggest a lack of motivation in participants to use the application. Ultimately, these study's results showed that the feature of customisation did not necessarily lead to higher intentions in users to engage with the app or to adherence in usage.

In regard to the quantitative component of the study the results showed a non-significant change of symptoms of GAD and a non-significant change of general well-being. However, improvements in the mental health of participants have been found in the raw data, contributing to the notion that *MoodMission* is effective in treating mental health complaints.

The role of customisation on intrinsic motivation was explored in more depth by using the SDT and its separate components. These comprise the need for competence, the need for relatedness and the need for autonomy. Participants were asked whether they felt competent, autonomous, and cared for by the application.

The investigation has shown that nearly all participants felt competent enough to use the application. This has been demonstrated by the fact that participants understood how they should engage with the app and could follow instructions. This finding was anticipated since the study of Bakker et al. (2018) demonstrated similar results for usability. Furthermore, previous research has already shown that usability is linked to competence in human-computer interaction (Wiklund-Engblom, Hassenzahl, Bengs & Sperring, 2009). However, customisable feature of *MoodMission* did not foster the perception of the need from the participants perspective. Instead, the navigability of the application did. This finding is in line with previous research on the navigability in technology. It has been shown that navigability strengthens users' perception of competence (Gwizdka & Spence, 2007).

With respect to the need for relatedness, it should be emphasized that none of the participants explicitly expressed the necessity of meeting the need to engage with *MoodMission*. Instead, it appeared that participants were satisfied to dismiss the application as a tool that fosters moods. Still, this finding implies a lack of meeting of the need as it does not have a human component. Previous research has shown that adding a social component in apps can contribute to meeting the need for relatedness and can foster user engagement (Alqahtani, Khalifah, Oyebode, & Orji, 2019). Especially the addition of a connection feature, for example, a *social support* function can serve as a strategy to enable a network between users. The *social support function* allows users to exchange experience with mental health complaints and facilitates finding support from other users who have similar issues (Alqahtani et al., 2019). In fact, this function can meet the need for relatedness (Joeckel & Dogruel, 2019). However, likewise to the need for competence, it has been shown that customisation had no impact on the need for relatedness from the perspective of the participants.

Last but not least, results have shown that from the participants perspective the choice to select a mission from a predetermined set of mission options (*By-alternative-customization* (see Methods: *MoodMission*)) might have given them a sense of autonomy. As previously mentioned, most participants felt active and in control to select missions. According to Bakker et al. (2018), the control of users to select one of the tailored missions is assumed to lead to a greater motivation to execute missions, to engage with the app and it strengthens coping self-efficacy (Bakker et al., 2018).

Still, findings indicated that some participants did not perceive a sufficient degree of freedom to determine the options of missions resulting in a feeling of being repressed in individuality and autonomy. These individuals might need a *full customization*, giving them complete autonomy over the whole content of the application and missions (Bleyer et al., 2018).

On the basis of findings, it turned out that the customisation of missions did not foster user engagement and continuation of usage in participants. Participants ceased to use the app *MoodMission*. At this point, it should be noted that the discontinuation of usage cannot merely be reduced to the absence of pathological complaints in mental health because the app also aims to attract non-clinical participants (Bakker & Rickard, 2018). *MoodMission* is designed for a population that is interested in the prevention of depression or anxiety and improving well-being (Bakker & Rickard, 2018).

Thus, the findings indicated that the application must attract more attention to persuasive strategies meeting the needs for intrinsic motivation and to avoid the discontinuation of use. The persuasive strategy of social support has already been proposed. However, more persuasive strategies are sought for, which in addition to customisation, can contribute to better adherence. An example of another persuasive strategy encompasses the implementation of reminders. Participants in this study mentioned that through the perceived lack of notifications, the *MoodMission* tended to fade in the

background. This finding implies that even though participants might benefit from the app they tend to forget about it which leads to attrition in usage. Research has already indicated that sending reminders might be a successful strategy to omit attrition rates. For example, it has been shown that sending prompts to remind people to revisit, for example a web page, can persuade them to reuse it (Schneider, Vries, Candel, Kar, & Osch, 2013). However, Bakker, Kazantzis, Rickwood, Rickard (2016), found that sending too many reminders can reduce intrinsic motivation to engage with the app, as it reduces the sense of autonomy. Nonetheless, reminders framed within the context of SDT can lead to greater encouragement in users. Hence, reminders should emphasize phrases that empower the individual to accept or refute (Bakker et al., 2016).

Moreover, it turned out that participants did not gain the impression that the app gave enough positive feedback on accomplished tasks. Already previous research has shown that individuals seem to have the desire for acknowledgement, even for digital acknowledgements in the form of feedback (Harackiewicz, 1979). Thus, providing users with positive feedback in order to praise them for the execution of missions might be another important strategy for the continuation of app usage (Alqahtani et al., 2019).

4.1 Strengths and Limitations

A particular strength of the study lies in the fact that the study was smaller, shorter, and more manageable than existing studies and was basically conducted with experience reports of non-clinical test persons. In this way, it was possible to show where discrepancies occurred, the importance of a sufficiently long period of use of the app, and whether or not clinical conditions being present in the participants, customisation can contribute to adherence in app usage.

However, several limitations appear to be the reverse of these advantages. The first limitation concerns the feasibility of the SDT in relation to the study, because this theory does not address unconscious, impulsive, and implicit influences on individuals' behaviour. However, these might also be of importance with regard to app engagement (Villalobos-Zúñiga & Cherubini, 2020).

Secondly, there exists a limitation of explanatory power with regard to the interview questions. Participants were not explicitly asked what their needs were in relation to the components of the SDT and what features *MoodMission* should possess in order to meet the needs. However, explicit asking could have evoked falsified answers, as are known from suggestive questions, even though some of the participants' needs in relation to the app might have remained undetected in this study.

Thirdly, interview questions could have dealt more explicitly with the perception of customisation of missions. These questions could have provided more meaningful information about some users' needs, and their demands on the app as well as on their perception of customisation.

However, here again the researcher's intention behind not posing such questions explicitly was to omit suggestive questioning with regard to others.

Concerning the quantitative research findings, it has been found that two potential reasons may have contributed to the non- significance of findings. Firstly, participants used *MoodMission* for a too short time, to be precise 14 days only. In contrast, Bakker, and Rickard (2019) conducted a similar study also investigating the effect of *MoodMission* on users' levels of anxiety and well-being for a period of 30 days. They found a significant improvement in participants' mental health. Hence, it is reasonable to deduce from the non-concordant results that the length of time the app is used has an influence on the results, respectively that the duration of app usage in the current study was too short in order to allow greater improvement. Yet, non-significant effects identified in this study can be considered corroborated by Bakker and Rickard. Secondly, the number of participants has not been sufficient to represent significant results when it comes to customisation in e-(mental) health. It only indirectly contributes to a better understanding of the significance of the number of participants, the relationship between the need for treatment and discontinuation, as well as the time frame necessary in order to achieve improvement in mental health.

4.2 Conclusion

To conclude, this study demonstrates that, with due regard to the limitations mentioned, customisation did not have an impact on user engagement from the participants' perspective. Rather, the results show the necessity of refinements of persuasive strategies in order to foster intrinsic motivation in individuals for user-engagement in e-mental health mobile applications, like, e.g., *MoodMission*. There is some evidence that persuasive strategies such as social support, reminders and positive feedback might have a beneficial effect. Scientific studies with a focus on these issues should follow in order to further explore the usefulness of these strategies for the purpose of supporting continuation and reducing attrition. Also, the presence or non-presence of a clinical condition might contribute to the continuation or discontinuation of the app. Here again, further studies appear to be helpful in order to clarify whether devices like *MoodMission* should or should not distinguish between both groups of users.

Furthermore, the study has shown that the duration of the experiment seems to have a considerable impact on the improvement in participants' mental health. Subsequent studies should be arranged on the basis of a greater number of participants in order to gain a more precise knowledge on possibly varying effects of possibly different effects of different time periods.

Eventually, this study might also have given thought-provoking impulses with regards to the need for relatedness, as the findings of this study indicated that none of the participants felt a sense of

belonging with the app. Instead, participants perceived the app as a mere technical tool serving the purpose of improving moods. Therefore, it seems worthwhile to investigate whether persuasive strategies can lead to a sense of belonging with the app itself.

After all, the overall question for future research will be whether customisation can be a suitable means of increasing intrinsic motivation, which in turn can promote mental health through continuous use. In itself, customisation was not perceived as sufficient for intrinsic motivation, but other promising persuasive strategies have been discussed. These strategies, including social support, are an important topic for future research.

References

Alqahtani, F., Khalifah, G. A., Oyebode, O., & Orji, R. (2019). Apps for mental health: An evaluation of behavior change strategies and recommendations for future development. *Frontiers in Artificial Intelligence*, *2*. doi:10.3389/frai.2019.00030

Bakker, D., Kazantzis, N., Rickwood, D., & Rickard, N. (2016). Mental health smartphone apps: Review and evidence-based recommendations for future developments. JMIR Mental Health, 3(1). doi:10.2196/mental.4984

Bakker, D., Kazantzis, N., Rickwood, D., & Rickard, N. (2018). Development and pilot evaluation of smartphone-delivered cognitive behavior therapy strategies for mood- and anxiety-related problems: MoodMission. *Cognitive and Behavioral Practice*, *25*(4), 496–514. doi: 10.1016/j.cbpra.2018.07.002

Bakker, D., & Rickard, N. (2019). Engagement with a cognitive behavioural therapy mobile phone app predicts changes in mental health and well-being: MoodMission. *Australian Psychologist*, *54*(4), 245–260. doi: 10.1111/ap.12383

Bang, M., & Ragnemalm, E. L. (2012). Motivational Technologies: A theoretical framework for designing preventive health applications. *Persuasive technology design for health and safety: 7th International Conference, Persuasive 2012, Linköping, Sweden, June 6-8, 2012. Proceedings*. Berlin: Springer.

Berg, S. V. D., Shapiro, D. A., Bickerstaffe, D., & Cavanagh, K. (2004). Computerised cognitive-behaviour therapy for anxiety and depression: A practical solution to the shortage of trained therapists. *Journal of Psychiatric and Mental Health Nursing*, *11*(5), 508–513. doi: 10.1111/j.1365-2850.2004. 00745.x

Bleier, A., De Keyser, A., Verleye, K. (2018). Customer engagement through personalization and customization. In Palmatier, R.W., Kumar, V., Harmeling, C.M. (2018). *Customer Engagement Marketing* (pp.75-94). doi: 10.1007/978-3-319-61985-9_4

Davey, G. (2014). Psychopathology: Research, assessment and treatment in clinical psychology. Great Britain: Wiley.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of advanced nursing, 62 1*, 107-15.

European Patent Office. (n.d.). Methods and apparatus for providing haptic feedback in interacting with virtual pets.Retrieved from: https://patents.google.com/patent/EP1440414A2/en

Gwizdka, J., & Spence, I. (2007). Implicit measures of lostness and success in web navigation. *Interacting with Computers, 19*(3), 357-369. doi: 10.1016/j.intcom.2007.01.001

Harackiewicz, J. M. (1979). The effects of reward contingency and performance feedback on intrinsic motivation. *Journal of Personality and Social Psychology*, 37(8), 1352-1363. doi:10.1037/0022-3514.37.8.1352

Headspace. (2020). Retrieved from: https://www.headspace.com/gb

International Covenant on Economic, Social and Cultural Rights. (1987). *Human Rights Quarterly*, *9*(2), 274. doi:10.2307/762298

Jimenez, P., & Bregenzer, A. (2018). Integration of ehealth tools in the process of workplace health promotion: Proposal for design and implementation. *Journal of Medical Internet Research*, *20*(2). doi: 10.2196/jmir.8769

Joeckel, S., & Dogruel, L. (2019). Default effects in app selection: German adolescents' tendency to adhere to privacy or social relatedness features in smartphone apps. *Mobile Media Communication, 8*(1), 22-41. doi:10.1177/2050157918819616

Pope, C., Ziebland, S., & Mays, N. (2000). Analysing qualitative data. Qualitative research in health care, 63-81. doi: 10.1002/9780470750841.ch7

Kalyanaraman, S., & Sundar, S. S. (2006). The Psychological Appeal of Personalised Content in Web Portals: Does customization affect attitudes and behavior? *Journal of Communication, 56* (1), 110–132. doi: 10.1111/j.1460-2466.2006. 00006.x

Kang, J., Binda, J., Agarwal, P., Saconi, B., & Choe, E. K. (2017). Fostering user engagement. *Proceedings of the 11th EAI International Conference on Pervasive Computing Technologies for Healthcare - Pervasive Health 17*. doi: 10.1145/3154862.3154878

Kang, H., & Sundar, S. S. (2016). When self is the source: Effects of media customization on Message Processing. *Media Psychology, 19* (4), 561–588. doi:10.1080/15213269.2015.1121829

Kreuter, M. W. (2000). Tailoring: What's in a name? Health Education Research, 15(4), 1–4.

Linardon, J., & Fuller-Tyszkiewicz, M. (2020). Attrition and adherence in smartphone-delivered interventions for mental health problems: A systematic and meta-analytic review. Journal of consulting and clinical psychology, 88(1), 1.

Mccall, H. C., Richardson, C. G., Helgadottir, F. D., & Chen, F. S. (2018). Evaluating a web-based social anxiety intervention among university students: Randomized controlled trial. *Journal of Medical Internet Research, 20* (3). doi: 10.2196/jmir.8630

Mispel, C. V. D., Poppe, L., Crombez, G., Verloigne, M., & Bourdeaudhuij, I. D. (2017). A self-regulation-based eHealth intervention to promote a healthy lifestyle: Investigating user and website characteristics related to attrition. *Journal of Medical Internet Research, 19* (7). doi: 10.2196/jmir.7277

Nguyen, M. H., Smets, E. M. A., Bol, N., Loos, E. F., & Weert, J. C. M. V. (2018). How tailoring the mode of information presentation influences younger and older adults' satisfaction with health websites. *Journal of Health Communication, 23* (2), 170–180. doi: 10.1080/10810730.2017.1421729

One Mind Psyberguide. (2020). Retrieved from: https://onemindpsyberguide.org/apps/sanvello/

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67. doi: 10.1006/ceps.1999.1020

Schneider, F., Vries, H. D., Candel, M., Kar, A. V., & Osch, L. V. (2013). Periodic email prompts to re-use an internet-delivered computer-tailored lifestyle program: Influence of prompt content and timing. *Journal of Medical Internet Research, 15*(1). doi:10.2196/jmir.2151

Spitzer, R. L., Kroenke, K., Williams, J. W., & Löwe, B. (2006). A brief measure for assessing generalised anxiety disorder: The GAD-7. Archives of internal medicine, 166,1092–1097. https://doi.org/10.1001/archinte.166.10.1092

Sundar, S. S., & Marathe, S. S. (2010). Personalization versus Customization: The importance of agency, privacy, and power usage. *Human Communication Research, 36*(3), 298-322. doi:10.1111/j.1468-2958.2010. 01377.x

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S.,Brown, S. (2007). The Warwick-Edinburgh mental well-being scale (WEMWBS): Development and UK validation. Health and Quality of Life Outcomes, 5, 63.https://doi.org/10.1186/1477-7525-5-63

Vaghefi, I., & Tulu, B. (2019). The continued use of mobile health apps: Insights from a longitudinal study. *JMIR MHealth and UHealth, 7*(8). doi:10.2196/12983

Villalobos-Zúñiga, G., & Cherubini, M. (2020). Apps that motivate: A taxonomy of app features based on self-determination theory. *International Journal of Human-Computer Studies*, 140, 102449. doi: 10.1016/j.ijhcs.2020.102449

World Health Organization (WHO). Ottawa charter for health promotion. Ottawa, ON, Canada: WHO, 1986. Retrieved from: https://www.who.int/healthpromotion/conferences/previous/ottawa/en/

Wiklund-Engblom, A., Hassenzahl, M., Bengs, A., & Sperring, S. (2009). What needs tell us about user experience. *Human-Computer Interaction – INTERACT 2009 Lecture Notes in Computer Science*, 666-669. doi:10.1007/978-3-642-03658-3_71

Zacarias, M., & Oliveira, J. V. (2014). *Human-Computer Interaction: The Agency Perspective*. Berlin: Springer Berlin.

Appendix

Appendix A: General Anxiety Disorder- 7(GAD-7)

GAD-7

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

Total Score ___ = Add Columns ___ + ___ + ___

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
☐	☐	☐	☐

Appendix B: Warwick-Edinburgh Mental- Well-being Scale (WEMWBS)

The Warwick-Edinburgh Mental Well-being Scale (WEMWBS)

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last 2 weeks

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

Appendix C: Interview guide

1. What made you decide to join this study?
2. What happened when you downloaded the application? Can you walk me through that process?
3. What does MoodMission offer you?
4. How does the app fit your life?
5. How many times did you use the application?
6. Did you feel competent enough to use the app? Why, why not?
7. What makes you want to continue using the app?
8. Why did you stop using the app?
9. How did you engage with the app?
10. Did you have (particular) daily moods that promoted the use of the app, if so which one/ones?
11. Do you feel that the app sees you? Why or why not?
12. Does the app make you more aware of your mental health? If yes, how? If no, why not?
13. Do you feel the app changed your view on your mental health? If yes, how? If no, why not?
14. Did you get the impression the app takes care of you? Explain.
15. Have you done "missions" and if so, how did you experience them?
16. Did you have an active role in planning the activities? Explain.
17. Did you feel active control over the content of the app? Explain.
18. After the usage of two weeks: Did you gain a sense of control over your “problems”? If yes, explain.
19. While using the app, did you feel there is a form of any interactivity? If yes, explain.
20. What does that interactivity provoke in you?
21. How much does the app mean to you by now? Why? Or: How do you feel about the app?
22. What was your overall experience with the app?

Appendix D. Raw Data

	Score			
Participant	Pre -Wellbeing	Post-Wellbeing	Pre-Anxiety	Post-Anxiety
1	58	59	9	9
2	44	42	11	14
3	49	40	10	10
4	49	58	15	11
5	55	53	11	15
6	25	37	19	13
7	36	38	23	18
8	53	45	14	12
9	44	47	20	14
10	54	51	8	13