A mood tracking interface for mobile application

-to help assess well being in students.

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Abstract

Many students struggle with mental health issues, however, research show that few of them seek help for their problems (Knapstad et al., 2018). In this study, a mobile mood tracking interface is developed with the objective to explore how to best motivate students to track their mood. What the state-of-the-art says about using a mobile application to help students with mental health problems (RQ1) was investigated through a literature review. Research through design (RtD) formed the basis of this research, where a mobile mood tracking interface was developed using an user-centered design process. The interface was evaluated by mental health experts, heuristically by usability experts, and through user testing: design exercise, usability testing, and interviews with students. The design process explored how students perceived the interface (RQ2), and which recommendations designers of a mobile mood tracking interface should consider, in order to best support an intuitive design to motivate students to track their mood (RQ4). In addition, a survey was performed to explore students attitudes towards sharing mental health data (RQ3).

The literature review showed that a mobile app that provide self-report could be a good tool to asses well being in students, however, current apps have low engagement within the users. Findings in the prototype, revealed that the way of tracking mood worked fine, however, the students interpreted colors and emojis differently, enjoyed different layouts, and had different notifications preferences. This shows a need for personalization. Students should be able to personalize layout, change notification frequency, and customize colors and emojis on a set of predefined emotion labels. The survey result indicates that students are positive towards sharing mood statistics and notes, however, they are concerned with security and privacy, and thus are less willing to share sensitive data. This thesis contributes to the research field with an analysis of functionality in mental health apps, by producing an artifact, and providing a set of recommendations of what to consider when designing a mood tracking interface for students. Future work can extend these recommendations by performing a longitudinal study investigating motivation, and the interface should be tested with real users, targeting persons with psychological issues.

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Contents

1 Introduction

Throughout life we will all experience challenges that will affect our mental health and well being. Not all of us will develop a severe mental disorder, however, everyone will experience psychological issues and mental crisis at some point. Be it that we are experiencing life transitions such as changing school, moving away from home, starting a new job, getting married, going through a divorce, having kids, retiring, or experiencing the death of our loved ones. Except for the fact that we all go through life transitions, there are many factors in our everyday life that can play a part when it comes to our mental health. Sometimes we experience specific situations that make it obvious as to why we feel depressed or happy. Other times, it can be really hard to know what caused the emotions that led to our mood state.

Self-screening is a commonly used approach to detect and assess mental health problems (Håvik et al., 2019). This research aims to contribute towards a mobile mood tracking app that can facilitate awareness and reflection of moods, so users can better understand the influencing factors, and thus be able to change these to improve their mental health.

1.1 Background

Unfortunately, it is often the case that persons who seek help for mental health problems are left to themselves if their case is not severe enough. These persons often tend to come back when they are much worse (Sundquist, 2020). Several studies have shown that there are many students struggling with mental health issues. A large study called SHot (FHI, 2018, Knapstad et al., 2018), carried out by the three largest student welfare organizations in Norway (Sio, Sammen, and Sit), in cooperation with the Norwegian Institute of Public Health, investigated students mental health, and revealed that more than one out of four (approximately 25 %) students experience severe psychological issues. Regarding sleeping habits, the study found that almost one out of three (31%) students suffer from insomnia. Researcher and psychologist Sivertsen draws a parallel to the report that more students are struggling psychologically (Hanger, 2018). In addition, Sivertsen points out that another reason for problems with insomnia

among students might be that they are always 'logged on' technological devices. A longitudinell study (Hafstad, 2019, Viner et al., 2019)[1] of young persons in England, found that girls who use social media very frequently have more psychological issues. The authors concluded that this might be caused by a combination of cyberbullying, lack of sleep, or physical activity.

Statistics show that many students struggle, however, according to the results from SHot (Knapstad et al., 2018), few seek help for their issues. Despite the fact that it is widely recognized that early detection, intervention, and suitable treatment of mental health disorders can have life-changing impact on a person's mental health and well being (Davey and McGorry, 2019, McDaid et al., 2017, Mcgorry and Mei, 2018, Patel et al., 2018), one needs to have a certain severeness to qualify to get help from the Norwegian healthcare system. The World Health Organization (2019), has endorsed the use of mental health apps to provide evidence-based digital interventions. They argue that digital interventions have the potential to meet the challenge of reaching universal health coverage. This supports the aim of this study, which is to explore how to best create a mood tracking interface for a mobile application.

1.2 Research problem

A mood tracking interface is designed with the intention of forming part of a mental health app for students[2]. The app as a whole is meant to detect students who struggle with mental health problems, to help them change behavioral patterns that influence their mental health, and in addition, provide the opportunity to suggest that they get professional help. To be precise, this research focuses only on the mood tracking interface.

Being an information science student with background as a nurse, and having a strong interest in usability and design, the choice of a master thesis topic at the intersection of health and interaction design, became an obvious decision. The motivation for this project is to provide self-screening in the form of a mobile mood tracking interface, in

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[2] The idea for developing a mental health app for students originated with a local SME; the pre-phase and iteration 1 were done in collaboration with the SME.

order to help students who are at an early stage of facing mental health issues. The research has two main focus areas: a psychological focus with the aim to help students with mental health problems; and, a technological focus on the the interaction design of the interface. This lays the ground for exploring the following research questions:

Guiding question:
How do we best motivate students to track their mood in a mobile mood tracking app?

Sub-questions:
RQ1: What does the state-of-the-art say about using a mobile application to help assess well being in students?

RQ2: How do students perceive the mood tracking interface?

RQ3: What are students' attitudes towards sharing data about their mental health?

RQ4: What should designers of a mobile mood tracking interface consider, in order to best support an intuitive design to motivate students to track their mood?

Regarding the first research question, a literature review was conducted to establish whether a mobile application is a suitable tool to help asses well being in students. The second and fourth research questions seek to explore which characteristics motivate the user group, and which design principles are to be considered. To explore this, feedback from both users(students), usability experts, and domain experts(psychologist) was elicited. In order to respond to the third research question regarding students attitudes towards sharing data about their mental health, a survey was utilized.

1.3 Contribution

Most studies in mental health technologies do not have usability evaluation as their main focus (Inal et al., 2020). To the best of my knowledge, there has been little research investigating how to make mood tracking more engaging, in order to get a higher compliance within the user group. This motivated the objective of this research, which is to explore how to best motivate students to track their mood in a mobile mood tracking app. The research will contribute to the field with an analysis of functionality in mental health apps, by producing an artifact, and presenting a set of recommendations of what to consider when designing a mood tracking interface for students.

1.4 Chapter Summary

This chapter described the background for this thesis work, and the research problem. Four research questions related to the problem area were defined to guide the thesis work, and it was stated how this work will contribute to the research field. Throughout the thesis, you will first be presented with relevant literature in chapter 2. Next, chapter 3 presents the methodology and methods of the study, followed by a description of the development process of a high fidelity prototype of the mood tracking interface in chapter 4. The final high-fidelity prototype is presented in chapter 5. Chapter 6, describes a survey of student attitudes to mood tracking. In chapter 7, the findings from the literature review, the findings from the prototype development and the survey will then be discussed, and the research questions will be answered, before wrapping up the thesis with a conclusion in chapter 8.

2 Literature

This section presents relevant literature. First, the field of Human-Computer Interaction(HCI) in which this research is situated, is described, including the centrality of user experience. Next the literature search is described, followed by an overview over relevant studies, security challenges, research focused on usability when designing for mental health, and similar products.

2.1 Human-Computer Interaction

The field of human-computer interaction(HCI) was formally founded in 1982, however, work was done before that might be considered to be HCI work. In the late 1970s and the start of 1980s, there was a shift where people without technical training started to use computers. Earlier the use of computers was limited to research in laboratories by highly trained technical persons. The personal computer made its debut when Apple 11 series, IBM, and the Commodore/Vic entered the market. This resulted in computers being moved from secure locked spaces to people's homes, and could now be used by anyone. This shift lead to the importance of a research field studying the interaction between human and the computer (Lazar et al., 2017, p. 1-2).

Many disciplines contributes to the field of HCI. A major shift occurred in the 1990s with the emergence of the Internet and the web, which lead to new types of interfaces and communication. This resulted in that many disciplines were included under the 'umbrella' of HCI, such as computer science, sociology, psychology, communication, human factors engineering, industrial engineering, and rehabilitation engineering, to mention a few. As a result of the inclusion of multiple disciplines, HCI has adapted methods from other fields, and modified them to be ad hoc (Lazar et al., 2017, p. 2-4). Wobbrock and Kientz (2016), suggest a classification of seven types of HCI contributions; empirical, artifact, methodological, theoretical, dataset, survey, and opinion. The majority of the research falls within empirical research or artifact contributions. This research will result in an interface accompanied by empirical data about feedback and usage, thus it falls within artifact contributions.

2.1.1 User experience

The user experience (UX) is central in HCI. Norman and Nielsen (2014), define it as "all aspects of the end-user's interaction with the company, its services, and its products." They stress that it is important to be able to distinguish the total user experience from the user interface (UI). The UI covers whether the system is for example, easy to learn, efficient, and aesthetically pleasing. UI forms an important part of the user experience, but there are many other factors that affects the user experience such as information revolving the product. It is also important to distinguish UX from usability. Whereas usability is referred to as a quality attribute of the UI, UX is a broader concept referring to the total experience the user gets from the UI as well as all other components in the life cycle of which the product is a part.

2.2 Literature review

A literature review was conducted both within databases that are unspecific of domain, such as WebOfScience, Google Scholar, and Bergen Open Research Archive (BORA), and domain specific databases for medicine, healthcare, and psychology, such as PubMed, MedLine, and PsycINFO. The literature search was conducted using the logic operators AND and OR with different combinations of the following keywords: 'mental disorder', 'mental health app', 'mood tracking', 'mobile application', 'student', 'young', 'self-screening'. As seen in table 1, the logic operator 'OR' was used to make groups of synonyms of the keywords, while 'AND' was used to combine these groups, table 2. The aim of the literature search, was to identify articles in which met the following criteria; focusing on

1. Mental health intervention,
2. Mobile application technology,
3. Interaction design, by containing usability evaluation with empirical evidence.

   In addition,

4. Written in English or Norwegian, due to limitations of language knowledge.

5. Within the time period 2015-2020.

Table 1: Overview over literature search using 'OR' to expand search in Web of Science.

Web of Science	**Search using logic operator 'OR'**	**Number of hits**
#1	well being, well-being, mental disease, mental issue, mental disorder, mental illness, psychiatric illness	589,515
#2	self-screening, self screening, self-report, self-assessment, assessment, measure	5,290,447
#3	mobile technology, mobile application, mobile	257,969
#4	user feedback, user centered, heuristic, user experience, interaction, interaction design	2,699,925
#5	mood-tracking, mood, mood tracking	106,324
#6	young, student	1,480,624

Table 2: Overview of literature search using 'AND' to narrow down search by combining the previously made searches in table 1.

Search using logic operator 'AND'	**Number of hits**
#1 AND #3, aim to find articles with work in mental health in mobile technology	4,355
#1 AND #3 AND #4, aim to find work with mental health in mobile technology that focuses on usability and design	627
#1 AND #3 AND #4 AND #6, aim to find work with mental health in mobile technology that focuses on usability and design, that considers the target group	76
#2 AND #5, aim to find articles where self-report is used to track mood	36,794
(#2 AND #5) AND (#1 AND #3 AND #4), aim to find work with mental health in mobile technology that focuses on usability and design, where self-report and mood tracking is part of the app	27
(#2 AND #5) AND (#1 AND #3 AND #4 AND #6), aim to find work with mental health in mobile technology that focuses on usability and design, where self-report and mood tracking is part of the app, and it considers the target group	5

The articles in the results of the last last two searches in table 2, failed to meet all criteria set for the selection, this indicated that the search was too narrow. However, a systematic review of usability evaluations of mobile mental health technologies by Inal et al. (2020) was found in the second search. The reference list of this article was used to nest more relevant research. In addition, more general keyword searches using the term 'mental health app' was used in other databases. Inal et al., state that there are few studies in mental health technologies that have usability as their main focus, this could be an possible explanation why the narrowest search failed to find relevant articles.

2.2.1 Mental health app research

There exists more than 10 000 mental health apps on the market today (Torous et al., 2018), however few of the apps are rigorously evaluated in controller trails (Mohr et al., 2017). Carlo et al. (2019) combined data from online behavioral health app rating frameworks and a mobile health market research firm to identify the most downloaded applications. This was done in order to determine the rating and ranking concordance between the frameworks. Results revealed that most of the commonly downloaded apps focus on relaxation, mindfulness, and mediation skills, and they often lack consistency in their reviews across different rating frameworks. The study implies that there is a need for: standardizing behavioral health app quality and effective measures, up to date behavioral health app guidance for both clinicians and consumers, and evidence based applications.

Mohr et al. (2017), address what they believe to be major challenges in the research of mental health technologies. The first challenge they discuss is the fact that mental health technologies often are evaluated as products, were the technology is described and evaluated, but it lacks evaluation of the ecosystem of which the technology is a part. They believe this has led to mental health technologies being developed without understanding of how they will fit into mental health services. The study suggests that mental health technologies instead ought to be defined as technology-enabled-services.

Sustained behavior change is often required to improve mental health conditions. The available mental health technologies often require the users attention and motivation, however, motivation and engagement is often something persons struggling with mental health problems lack, due to the feeling of hopelessness. As the technologies are mainly informational they might not be ideal to promote engagement. There is therefore a need for easier and improved design to be able to sustain the users engagement over time. However, even though improved design may make it more engaging, mental health technologies often require human support in the form of a professional to sustain engagement.

Another challenge is that a top-down approach has been widely used when designing mental health apps. Researchers have designed tools without consulting patients to get

input on their needs and goals, which has resulted in designing tools one thinks the patients need. The study suggest that a design ought to consider input from key stakeholders, such as patients, providers, administrators, and information technology managers. Recruitment challenges should be seen as an indication of failure in design and/or the implementation strategy.

The last challenge they address is the misconception that mental health technologies are a new way to deliver psychotherapy. This has led to a rigid thinking, which prevents researchers from thinking outside the box, resulting in digital development just mimicking old models. They state that technology could revolutionize mental health care, and that new technologies should be taken into consideration such as artificial intelligence, natural language processing (NLP), and virtual reality (VR).

Ecological momentary assessment (EMA), is a process of capturing data from participants in real time, to investigate how behavior changes over time. It is useful to explore symptoms of psychopathology and affective states (Shiffman et al., 2008). Kenny et al. (2016) investigated the utility of a mobile phone as a means of collecting EMA data regarding mood, coping efficacy, and problems among Irish young people in a school. To explore this, they used a randomized controlled trial (RCT). The participants downloaded a mobile app called CopeSmart where they could respond to a 5 single-item measures of key protective factor in youth mental health. In addition, they completed a pen and paper questionnaire with standardized measures of emotional distress (Depression, Anxiety, and Stress Scale; DASS-21), well being (World Health organization Well-Being Index; WHO-5), and coping (Coping Strategies Inventory; CSI). The study found that using a scale of 1 to 10, happiness was the highest rated mood state, while anger was the lowest. Overall the Analyses revealed that EMA data can provide useful insights into mood states, coping efficacy and links between daily experience of problems. The indication of low engagement suggest that attention should be given to ways of promoting participant engagement of the application, which underscores the aim of this Masters research.

Caldeira et al. (2018), conducted an in-depth feature analysis of 32 apps that have mood tracking as their main function. There exist many emerging technologies that track users moods, however, they state that the accuracy of such technologies is unclear,

due to the fact that mood and emotions are subjective. Because of this, they chose to limit the review to apps that provide self-report. The study investigates the self-tracking process through 5 stages: 1) *Preparation stage*, planning before collecting data; information, instructions, explanations and resources to support the user 2) *Collection stage*, when the users record data; features supporting mood recording, and reminders to log mood. 3) *Integration stage*, formatting and combining data, 4) *Reflection stage*, making sense of, and learning from the data; most commonly featured as data visualization 5) *Action stage*, when the users act based on what they learned from the reflection; features providing recommendations or resources to the user based on their mood, and a sharing feature to share or export their tracked mood data. In addition to reviewing features, they analyzed user reviews on the apps.

Their results, showed that for the *Preparation stage*, only 8 apps provided substantial information to support and help the users to track their mood, whereas the remaining provided very limited or no information. Regarding the *Collections stage*, a diverse set of tracking interfaces were found, namely 1) pre-defined text that the users could select, 2) Free text that the user could type in, 3) colors to select that represented their mood, 4) pictures, including taking a picture or choosing one in the app to represent their mood, 5) recorded audio, 6) emojis or similar image to pick that represents their mood, 7) ratings; 21 of the apps allowed the users to apply the degree/intensity of a particular mood. Some of the apps supported the users in adding notes to their mood, and only a third of the apps included reminders to track mood. For the *Reflection stage*, most (29) apps provided mood visualization as bar and pie graphs, whereas others had lists, line graphs, calendar view, and a mood meter. The pie charts and mood meter can give an overview of moods, while the calendar and line graphs can help users find pattern in time, and map view can help the users learn associations between mood and physical locations. When it comes to the *Action stage*, only 7 of the 32 apps had a feature to support future actions with recommendations such as, contact information to hot lines, and strategies to avoid triggers of stress. 25 of the apps had a sharing feature that allowed the users to share their data in social networks or to professionals.

When analyzing app reviews, they found that the users motivations for utilizing the apps were to find patterns in mood data, learn about influencing factors, to monitor

symptoms, and make changes to improve their mood. The current usage of the apps were to log mood, add explanations to mood to facilitate reflection, and to share data with healthcare providers. The users desired features for specific mental illnesses, features to add contextual information, and being able to personalize input.

Since this research limits the main focus on the action of tracking mood in the interface, it will be mainly concerned with the collection stage, thus including features to collect mood data, such as text, colors, emoticons, and reminders for the users to log their mood.

2.2.2 Security

As Olff (2015) states, a remaining challenge of m-Health tools is issues such as who owns the data, and who has access to the data. It is important to consider how users experience mental health applications, and what their attitudes are towards sharing their data. That the users trust the application and can rely on the security for storing their data, will be essential for whether or not, they will be willing to use the application. This is ever more important when dealing with sensitive data such as data related to a person's mental health problems. The General Data Protection Regulation(GDPR) (Intersoft Consulting, 2018), introduced new rights for people to access the information that companies store about them, obligations data management for companies, and new regime of fines across Europe (Wykes and Schueller, 2019).

Muravyeva et al. (2019), investigated student's attitudes towards personal data sharing in the context of e-Assessment. They found that approximately one of ten students are not willing to share any personal data. Further, their findings suggests that students are more reluctant to share video recordings of their face, than other personal data. In addition, those that were more dependent on, and felt a stronger need for technologies, were more inclined to consent to personal data use.

2.2.3 Designing for mental health

Inal et al. (2020), conducted a systematic review of usability evaluations of mobile mental health technologies. Of the 42 articles included in the study, they found that half of them evaluated usability, while the remaining articles either focused on acceptability or feasibility. However, the results indicated that usability was not their main focus, due to the fact that most studies described their methods as trials where they gathered data from a small sample size, and used a single questionnaire to carry out a summative evaluation. This study implies that there is a need for a standardized m-Health usability questionnaire.

Many studies have shown to have low engagement with the mobile mental health app, which is a problem due to less data on which to make research (Kenny et al., 2016). This, however, does not come as a surprise since there are few studies that has usability as their main focus. The study of Kenny et al. (2016) had only 18% response rate, and they discuss that other studies might had a higher rate due to incentives or better informed participants. Their research, however, does not focus on usability evaluation of the application.

An example of research that has focused on usability evaluation is the study of Huguet et al. (2015), which used an iterative participatory design to develop and test a electronic headache diary. The participants used the diary in their natural environment for two weeks. In addition, they performed interviews of usability and feasibility testing. The psychometric properties of the diary were tested and they completed a case study analysis of one participant. They had two different Post-Questionnaires, one for usability/feasibility testing, and one for psychometric testing. The results showed that the final version of the diary was perceived as useful, easy to learn, and efficient to use.

Branco et al. (2021), made an interaction design analysis of mood trackers, where they concluded that a lot more user-centered design can be used to improve the current mood trackers. The mood trackers they analyzed seemed to be lacking a defined target audience without no concrete goal and objectives. Further, they found that none of the applications had support from mental health specialists, which they state is worrisome since persons that look up such apps most likely are struggling with mental health

problems. Without any input from mental health specialists, this could be more damaging than good. They state that knowing the target audience, exploring their expectations and goals, and having support from mental health specialists can help designers turn a simple habit tracking application to something useful to support therapy. In addition, they argue that especially medical-related apps should have guidelines for the designers to follow. Where they state that a good first step could be a co-design between mental health specialists and interaction designers with dedicated usability and user experience research.

2.2.4 Similar products

As mentioned, there exist many mental health mobile applications available on the market today. Table 3 shows a preliminary analysis that was carried out by the 20th of March 2020, on an arbitrary collection of 24 mental health apps. It can be seen that mood tracking is a common feature. Many of them have the possibility to add activities or notes to the reported mood. This makes it possible to look at mood patterns, and discover what influences the users mood. Commonly, statistics and/or reports are provided in the apps to give the user an overview over their mental health. In addition, several apps offer mindfulness, meditation, and relaxation exercises. Some apps, as for instance TalkLife (2018), has a peer support function, where users can be part of a community, interact with others, make friends, and share what's on their mind. TalkLife provides a support community for anxiety, depression, eating disorders, and self-harm. Even though this is an arbitrary collection of mental health apps on the market, it is interesting to see that only one out of the 24 apps do provide support from professionals.

Table 3: Analysis of the main functionalities in 24 different mental health apps.

Function	Mental Health App
Mood tracking	Moodpath, Daylio, Youper, Depression CBT Self-Help Guide, What's Up?, Sanvello (Formerly Pacifica), Moods, Moodkit, MindSHift CBT, WooryWatch, eMoods, Mood-Track Diary, RealifeChange, iMoodJournal, T2Mood Tracker, Track your Happiness.
Mindfullness, Relaxation, and Meditation	Moodpath, Depression CBT Self-Help Guide, What's Up?, Sanvello (Formerly Pacifica), Happify, Depresjon-sappen, Moodkit, StressProffen, MindSHift CBT, Youper, Breathe2Relax, RealifeChange, Smiling Mind.
Peer Support	TalkLife, What's Up?, Sanvello (Formerly Pacifica), SAM-app, MoodTrack Diary, aiMei
Professional support	T2Mood Tracker
Courses and Information	Depression CBT Self-Help Guide, What's Up?, Depresjonsappen, StressProffen, Breathe2Relax

2.3 Chapter Summary

This chapter described literature that is relevant for the research problem for this thesis work. More specifically, it described the research field of HCI, explored the *state-of-the-art* within the research problem area by performing a literature search where relevant studies were presented, and explored similar products.

The literature gave valuable insight about existing motivations, usage, and challenges of mood tracking apps, that will be used to start the development process of the mood tracking interface in Chapter 4.

3 Research Design

In order to respond to the research questions, cooperation with a user group will be crucial, thus an iterative user-centered design process with a focus on usability and user experience was considered to be a suitable choice. This chapter gives an overview of the methodology and methods that were used to design a mood tracking interface for students. Research through design formed the basis of this research.

3.1 Research through design

A method for interaction design research within the HCI field was proposed by Zimmerman et al. in 2007. The method follows a research through design (RtD) approach, where designers produce new HCI research in order to create the "right thing : a product that transforms the world from its current state to a preferred state" (Zimmerman et al., 2007).

The method enables interaction designers to make contributions to research based on under-constrained problems. In this research RtD was chosen because it acknowledges a prototype as a source of knowledge, and that an artifact can be a research contribution in itself, which allows for designers to have an exploratory approach to research. The model provides the following set of criteria to evaluate research contributions in interaction design, which was used to evaluate this thesis research contribution (Chapter 8):

Process In contrast to other research areas, it is not expected that repeating the research process in interaction design will lead to the same results. However, the process is nevertheless considered to be a critical element when evaluating the quality of a research contribution. To evaluate the process, rigor that is applied to the methods and reasoning made for selection of methods are examined.

Invention In research, interaction designers must clearly demonstrate that their produced artifact is a solution addressed to solve a specific situation. To be able to show this, it is necessary to conduct an extensive literature review to gain an oversight over the state-of-art, in order to assure that their contribution advances the research field. Further they must provide guidance to other researchers and engineers in the field, by communicating opportunities that may flourish if technology advances.

Relevance Instead of using validity, as, in many other scientific areas, interaction design uses relevance as benchmarking. Relevance includes argumentation of the impact the contribution will have on the world, and why it is important. Without this, a RtD will only be personal exploration.

Extensibillity The criteria of extensibility means that the research should be well documented so that other researchers in the field can leverage from the work, derive knowledge from it, and thus be able to extend the work.

3.2 Literature review

Literature review, also known as desk research or secondary research, is a critical first step for any research process (Oates, 2006). It is the gathering, analyzing and summary of work that has been published in the field. It has the purpose of giving researchers insight to the state-of-the-art, so that researchers can build upon previously work and knowledge, and make sure their work will be a new contribution that has relevance to the field. The results of the literature review are presented in Chapter 2.

3.3 Design and Implementation Methods

This section describes the methods that were used for designing and implementing the mood tracking interface.

3.3.1 User-centered design process

In user-centered design the real user's goals should be the main driving force for the development process (Sharp et al., 2015, p. 327-330). Gould and Lewis created three principles in 1985 that they believed would lead to a useful and easy computer system. These principles are considered the basis of a user-centered approach, however they were not accepted by most developers at the time when Gould and Lewis wrote the paper. Gould and Lewis (1985) recommended the following principles:

Early focus on users and tasks is the first principle of design. Gould and Lewis argue the importance of studying the cognitive, behavioral, anthropometric, and attitudinal characteristics of the users, and the nature of what work is expected to be accomplished. This is important in order to understand who the actual users are.

Empirical measurement Second, they argue that simulations and prototypes should be utilized to carry out real work so it is possible to observe, record, and analyze the performance and reactions of the users towards the intended product.

Iterative design Last, they state that an iterative process is needed to fix problems that are discovered in the user testing. They suggest an iterative design process that is repeated as much as needed, consisting of test, measure, and redesign.

Persona

Personas are rich descriptions of typical persons in a product's user group. They describe fictional characters, but are tried to be made realistic rather than idealized. Personas are created in order for it to be easier for designers to focus on who the user will be, when designing a product. The persona is characterized by a set of goals related to the product in development, skills, attitudes, tasks, and environment (Sharp et al., 2015, p. 357-358). A persona was created in the pre-phase of the prototype development (Chapter 4), in order to better understand what the users needs would be.

Use case

A use case focus on the users perspective and users goals. It consist of an *actor*, and the *system* that tries to capture the actors goals. The use case describes a set of actions that the actor can perform within the system. Normally, the "normal course" is described of how the actor will navigate. In addition, alternative courses that the users can perform are often stated (Sharp et al., 2015, p. 376-377). A use case was created in the pre-phase of the prototype development (Chapter 4), and updated in later design iterations. It was used to present the main goal of the interface, and help the design process to see how the users would interact with the mood tracking interface.

3.3.2 Conceptual design

Conceptual design is the process of transforming product requirements into a conceptual model. The model is an outline of how users can interact with the intended product. It needs to give an understanding of what the application domain is, who the user group will be, and what type of interaction, interface, and terminology they will use (Sharp et al., 2015, p. 397-398). A conceptual design was created in the pre-phase of the prototype development (Chapter 4), and updated in later design iterations. It was used to present how the user could interact with the system

3.3.3 System requirements

The initial requirements that were set for the mood tracking interface are described in the pre-phase in Chapter 4. The requirements were redefined in each design iteration based on the evaluation of the prototype.

A **Requirement**, is a statement that specifies how an intended product should perform (Sharp et al., 2015, p. 353). The goal is to make a requirement as specific and clear as possible, in order to be able to measure whether the requirements are met.

Functional requirements (Sharp et al., 2015, p. 354), captures what the system should do. In order to determine the functional requirements for the interface, it is important to gain insight into the users needs.

Non-functional requirements (Sharp et al., 2015, p. 353-355), say something about the types of constraints there are on the system and the development of the system. These constraints could, for instance, be related to look and feel requirements, usability and humanity requirements, performance requirements, maintainability and support requirements, and security requirements. Since this thesis focus is limited to the mood tracking interface in the application, security requirements will not be covered. However, security measures necessary for the students to trust, and thus be willing to use the application, will be explored in Chapter 6.

3.3.4 Prototype

A prototype is one manifestation of a design. It is often limited by focusing on one set of characteristics of the intended product. It could be anything from a paper-based storyboard to a complex software. A prototype is useful to discuss and evaluate different design ideas with stakeholders, and to test and evaluate ideas on users. It is an effective way for a designer to get feedback on the design in order to make improvements, and choose between design alternatives (Sharp et al., 2015, p. 386-387). There are three types of prototypes, as summarized in table 4, and described below. As described in Chapter 4, one low-fidelity, one mid-fidelity, and one high-fidelity prototypes were designed in this research.

A **low-fidelity** prototype does not work, nor is the appearance the same as for the final product. It is often made of paper or cardboard, rather that electronic screens and metal. Normally, it only provides a limited set of functions without the possibility to perform any of them. However, the advantage is that they are cheap, easy to make, and quick to modify, thus they are well suited for early exploration of requirements (Sharp et al., 2015, p. 389).

A **mid-fidelity** prototype is a prototype that is slightly more detailed than the low-fidelity. It is still rough, but is is a bit closer to the solution. It is used after resolving the most obvious issues, and can give people a better sense of what the final solution will look like (Dam and Yu, 2019).

A **high-fidelity** prototype is fully interactive, it looks like the final product, and offers much more functions than a low-fidelity prototype. It is useful for testing technical problems, selling ideas to the market, and for exploring the user's experience of the look and feel of the final product. As it could be expensive to make and time consuming, it is not suited for establishing requirements (Sharp et al., 2015, p. 391).

Table 4: Advantages and disadvantages of different prototype fidelities (Sharp et al., 2015, p. 395).

Type	Advantages	Disadvantages
Low-fidelity prototype	Lower development cost Evaluates multiple design concepts Useful communication device Addresses screen layout issues Useful for identifying market requirements Proof of concept	Limited error checking Poor detailed specification to code to Facilitator-driven Limited utility after requirements established Limited usefulness for usability tests Navigational and flow limitations
High-fidelity prototype	Complete functionality Fully interactive User-driven Clearly defines navigational scheme Use for exploration and test Look and feel of final product Serves as a living specification Marketing and sales tool	More resource-intensive to develop Time-consuming to create Inefficient for proof-of-concept designs Not effective for requirements gathering

3.3.5 Design Principles

Design principles are general abstractions that are intended to orient designers towards important aspects to consider when designing. Many design principles have been promoted, however, the most common according to (Sharp et al., 2015, p. 25-30) are: visibility, feedback, constraints, consistency, and affordance. The principles were used when designing the mood tracking interface prototype in Chapter 4.

Visibility is the principle that the more visible the functions are, the more likely it is that the user is going to use them.

Feedback is a principle related to visibility. It involves giving information about different actions that the user has done and what they accomplished or failed to accomplish. This should prompt the users to continue with their activity without any uncertainty of what is happening. The feedback can be audio, tactile, verbal, visual, or a combination of several forms.

Constraint is an important principle because it makes it easier for the user to know what to do when their actions are limited. Constraint, for instance, can be seen in graphical interfaces as certain menu options displayed in a shaded gray color, showing the users that it is not possible to perform the action. This prevents the user from making mistakes.

Consistency when designing interfaces, has to do with implementing standards in the way that similar operations use similar elements to achieve similar tasks. When the interface follows such rules it benefits from being easier to learn and use.

Affordance refers to the fact that an object should allow people to automatically know how to use it. Physical objects have affordance, such as grasping, which may seem obvious because of essentially learned conventions, however, it is not automatically obvious what to do with an element on a screen interface. Norman (1999), argues that it does not make sense to design for screen-based interfaces to have real affordance, however, it is better to conceptualize as perceived affordances.

3.3.6 System development method

To assure a steady development progress, and to be able to structure the work, this research utilized agile methods. Trello, an online tool with the possibility to create boards and visualize tasks, was used. The system is built upon the agile method Kanban (Mesh, 2020). Kanban is flexible in the way that it is possible to create and respond to change in every step during an design iteration. The problems were split into smaller tasks, resulting in each iteration solving a smaller problem.

3.4 Evaluation Methods

This section describes methods of evaluation that were used to redefine requirements, and discover new requirements that were relevant for the design environment.

3.4.1 Data gathering

According to (Sharp et al., 2015, p. 227-230), there are five key issues that need to be addressed in order to perform a successful data gathering: goal setting, identifying participants, identifying relationship with participants, triangulation, and pilot studies.

Setting goals Specific goals should be specified for the data gathering. The goals could be more or less formal, however, they should be clear and concise.

Identifying participants The next step is to identify the participants from whom to gather data. This is usually indicated by the user goals. People that fit the description are called the *population*. However, often one has to choose which participants of the population to include in the study, called *sampling*. It could be *probability sampling* or *non-probability sampling*. In the former, random sampling and stratified sampling is most commonly used. Random sampling could be done by for instance choosing randomly every nth person in a list, whereas in stratified sampling, the population is divided into groups before applying random sampling. Convenience sampling and volunteer panels are types of non-probability sampling. In this research non-probability sampling was used and found participants that were available rather than selected specifically.

Relationship with participants It is important to make sure that the relationship between the collector of data and the participants is clear and professional. This will help clarify the nature and goal of the study. To support this, a consent form for the participants to sign was provided (see appendix C).

Triangulation Triangulation is the concept of combining different methods(mixed methodology), to look at a phenomenon from different perspectives. The methods can complement and reinforce each other, thus enhancing the value of the study (Jupp, 2006).

Pilot study A pilot study is a small trial of the main study, which is done with the purpose of assuring that the method chosen is viable (Sharp et al., 2015, p. 230). Since participants often are unpredictable, a small test of the plans is a good tool to identify potential issues with the method. However, since it can be difficult to gather participants, and taking into account that participants of the pilot study cannot be included in the main study, colleges and peers are a good substitute from whom to get feedback.

There were three participants that evaluated the mood tracking interface prototype; users(students), usability experts, and mental health experts. Retrieving feedback from different participant groups is in line with the data gathering concept of *triangulation*.

3.4.2 Expert evaluations

There were two types of experts that were consulted to evaluate the mood tracking interface: usability experts and mental health experts.

3.4.2.1 Mental Health Expert In order to assure that the interface was suitable within the domain of mental health, experts on mental health was contacted. The intention of the evaluations, was to get feedback on what to consider, and what changes were needed to improve the design to best suit persons with mental health problems. Feedback from mental health expert was given in the pre-phase, and the 1st design iteration on the low-fidelity prototype (Chapter 4).

3.4.2.2 Usability Expert Usability experts perform heuristic evaluations of artefacts. Nielsen's heuristic evaluation is a well known method.

Nielsen's heuristic evaluation A heuristic evaluation (Sharp et al., 2015, p. 501-503), is a method that investigates usability of a system. It was originally developed in 1994 by Jakob Nielsen and his colleagues (Nielsen, 1994). The heuristics were later modified by other researchers. The revised version of the heuristics can be seen in table 5. In a heuristic evaluation, usability experts are given heuristics(a set of guided rules), that they shall consider when evaluating the usability of an user-interface. Nielsen recommend to use between three to five experts, because the evaluators will detect different errors. As seen in figure 1, his findings show that they can normally detect 75% of the usability problems. Other researchers have later challenged these findings, arguing that how many experts are needed will depend on the nature of the problem. However, using less experts that Nielsen suggest is not recommended. The more experts the better, but one have to take the costs into consideration.

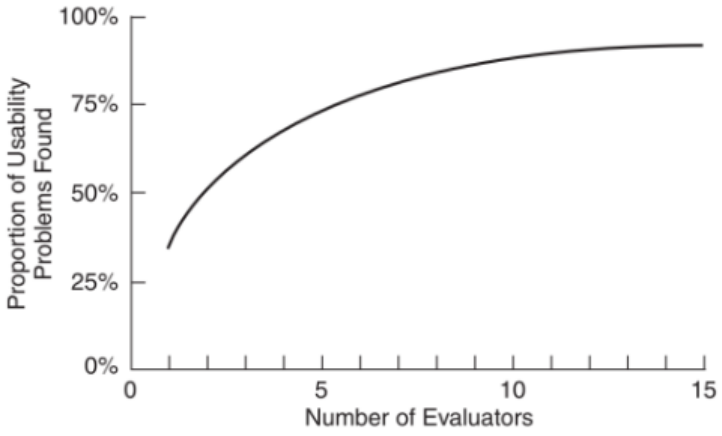

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Figure 1: Proportion of usability problems found by heuristic evaluators in an interface (Sharp et al., 2015, p. 503).

Table 5: The revised version of Nielsen's heuristics (Sharp et al., 2015, p. 501-502):

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

Three usability experts were used to perform a heuristic evaluation of the mood tracking interface during the 2nd design iteration on a mid-fidelity prototype (Chapter 4).

3.4.3 User Testing Methods

User test methods enable to collection of feedback on a prototype during iterative development. The user testing methods were performed in the 3rd design iteration (Chapter 4), to evaluate the high-fidelity prototype.

3.4.3.1 Usability testing is a method to test how usable a prototype or product is (Sharp et al., 2015, p. 457). The users from the target group are given a set of tasks to perform. By observing and sometimes timing of how long the users need to perform a certain task, valuable insight is given of changes that need to be done in order to improve the prototype. Usability testing was performed to explore how the students perceived and interacted with the mood tracking interface.

3.4.3.2 Unstructured Interview Unstructured interviews or open-ended interviews (Sharp et al., 2015, p. 233-234), consist of open questions where there is no expectations of what the format of the answer will be. The interviewer uses probing, a technique where one asks follow up questions to make the interviewee go more into depth about a particular question. The advantage is that one often get rich data, however since it is unstructured, it will often be different data you get from each participant, depending in which direction the interview goes. Thus, it could be challenging to analyze. The interviews were performed to explore more in-depth how students perceived the mood tracking interface after they had participated in the usability test.

3.5 Survey on opinions on tracking data

A survey is asking individuals to respond to a set of questions that is well-defined and well-written (Lazar et al., 2017, p. 106). The benefits of a survey is that one can easily collect data from a large number of participants. It can be a good tool to gain an overview over characteristics of the population. Surveys are often less obtrusive than other data collection techniques, and has a low cost. However, its disadvantage is that

the data collected does not go into depth. The fact that surveys typically are self-administered, deprives the data collector the opportunity of asking follow-up questions if an interesting phenomena occurs. The formulation of the survey questions is critical to avoid misinterpretation and bias in the data. In this research a survey was used to explore students attitudes towards tracking, and sharing mental health data in Chapter 6.

3.6 Chapter Summary

This chapter has thoroughly described the frame for this research, being research through design, and all the methods utilized during the design process including methods used to design, implement, and evaluate the mood tracking interface.

4 Prototype development

This chapter describes the iterative design process, where a pre-phase and three design iterations were carried out. One low-fidelity, one mid-fidelity, and one high-fidelity prototypes were designed. The user needs were first explored through desk research, and later through feedback from mental health experts, heuristic evaluations, user testing: design exercise, usability testing, and interviews during the prototype development process. First, an overview of the data that is collected is presented, followed by the development tools used. Next, the work in each design iteration is described. Each iteration consisted of a designing phase, a testing phase, and an evaluation phase, figure 2. The evaluation of the feedback of one iteration, was used to improve the design in the next iteration.

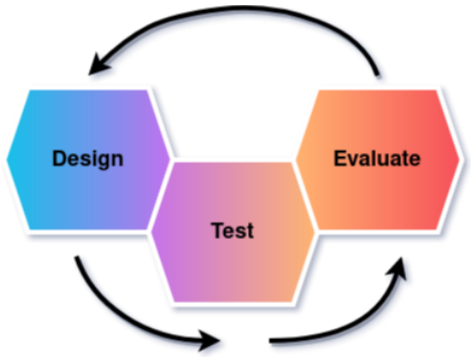


Figure 2: Representation of the phases in each design iteration.

4.1 Data Collection

Data was collected through a literature review, and through evaluations in the design iterations. Table 6, shows an overview of all the data that was collected in this research.

Table 6: Overview of the data collection process

	What data	How it was collected	What it was used for
Literature Review *in pre-phase*	What are motivations to use a mood tracking interface? What are the challenges of mood tracking apps?	Desk research.	To set initial requirements for the mood tracking interface, and create tools to guide the design iterations (conceptual design, use case, and persona).
Mental health experts *in pre-phase*	Expert opinions on initial sketches, and degree/intensity	Video meeting.	Determining degree/intensity scale for emotions.
Mental health experts *in iteration 1*	Expert opinions on emotions, degree/intensity scale, and color of emotions.	Workshop	Determining emotions, degree/intensity of emotions, and color of emotions.
Heuristic Test *in iteration 2*	Expert opinions on the mood tracking	Semi-structured interview. (Observation and field notes)	Re-evaluation of how to select mood, mood degree, and how to see statistics.
User Testing *in iteration 3*	How do people perceive the interface?	Small Usability Test of intermediate design: observation.	Determine if the new way of tracking mood is worth developing further.
	How do students interpret the emojis?	Design exercise: Students were shown a paper of the different emojis, and asked to name them.	See if the combination of emojis and emotions in the interface corresponds to how students interpret them.
	How do students interact with the interface?	Usability Test: observation and field notes.	Re-evaluation of mood tracking functionality.
	How do students perceive/experience the interface?	Unstructured Interview.	Re-evaluation of mood tracking functionality.
Survey	What are student's attitudes towards use of mood tracking apps, and sharing mental health data?	Survey	Explore students' attitudes, and motivation for using a mood tracking app.

4.2 Development tools

Webstorm Webstorm, is a text editor for modern JavaScript development made by JetBrains (2020). The text editor was used to write all the code for the application.

Vue.js Vue is a progressive JavaScript framework used to build user interfaces. The fact that it is progressive makes it possible to plug Vue into just a part of an application. It is designed to be incrementally adoptable and it makes it possible to reuse components (Vuejs).

Nuxt.js Nuxt.js (2020), is a framework that provides server-side rendering of Vue.js, and was used to handle the server-side of the web based version of the application.

Github Desktop Github Desktop is a commonly used host for version control (van Strien, 2016). It makes it possible to track and see history of all previously development work, and to make branches in order to experiment with different solutions without the risk of loosing previously achieved work. It is possible to merge different versions of your work, and to revert changes if something goes wrong.

Draw.io Draw.io is a free diagram tool connected to Google Drive, where it is easy to make e.g. flowcharts, Unified Modeling Language(UML), and organizational maps (Google Workspace Marketplace). The tool was used to create the conceptual design.

Firebase Firebase (2020) is a mobile platform owned by Google. The platform was used to store mood trackings of the users in Firebase's database, called 'Firestore'. The tool was used in the web based version of the app. To secure the database, authentication was setup in Firebase, creating login credentials for the users, and making authentication rules to the database to assure that the participants could only create/add, read, update, and delete mood entries that were connected to their user account.

Heroku Heroku (2020), is a cloud platform as a service (PaaS), that helps developers build, run, and deploy applications. The platform was used to deploy the mood tracking app, so experts and users could access the application during testing.

React Native React Native is a JavaScript framework released by Facebook in 2015. It supports building interfaces for mobile phone since it primitives render to native platform UI (Facebook, 2020). The framework was used when integrating the interface into a preexisting app in iteration 3.

Expo tool Expo (2020), is an open source platform with development tools that makes it possible to run native projects in web browser and in simulators both for Android and iOS using JavaScript and React. In addition, you can generate Android Package (APK) files, and iOS App Store Package (IPA) files to run projects on your mobile phone before deploying.

Android Studio Virtual Device Mananger The interface was used to create Android Virtual Devices(AVD) to simulate different devices in the Android Emulator (Google Developers, 2020).

MongoDB MongoDB (2020) is a document database that stores data in JSON-like documents. This was used to store the mood tracking made by the users in the native version of the app.

GraphQL is a query language that can be used with different databases. Instead of being tied to a specific database it is backed by code and data (The GraphQL Foundation, 2020). The query language was used to support the actions of tracking, retrieving, and deleting moods in the native version of the app.

4.3 Pre-phase

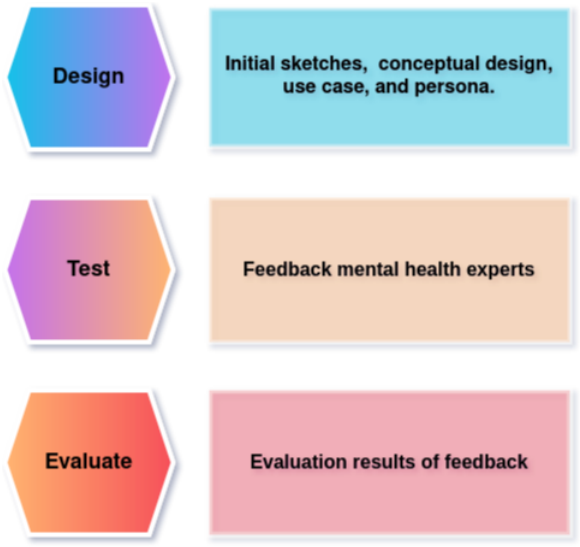


Figure 3: Overview of design iteration.

In the pre-phase, sketches were created based on initial requirements. In addition, a persona, a conceptual design, and a use case, were created to help guide the design process. Feedback on the initial sketches was given from a psychologist and a research coordinator at an SME working with technology for mental health care.

4.3.1 Motivations and usage of mood tracking apps

The literature review revealed that motivations for using a mood tracking app is to: find mood patterns, learn about influencing factors, monitor symptoms, and make changes to improve mood. The apps are commonly used to log mood, add explanations to mood, facilitate reflection, and share data.

4.3.2 Challenges of mood tracking apps

The challenges encountered in the literature review are that 1) products often lack evaluation in the context they are going to be used, 2) sustained behavioral change often requires human support to sustain engagement, 3) researchers have designed tools they think the users want without consulting the users about their goals, and 4) there is often a misconception that technology is a new way of delivering psychotherapy, which leads to rigid thinking of the design.

This research will address these challenges by developing a mood tracking interface through a user-centered approach with a main focus on usability and the users needs.

4.3.3 Initial requirements

Based on the insight gained from the desk research, the following were set as initial requirements for the mood tracking interface.

The functional requirements:

- Provide a mood tracking functionality where the user can select between a set of different moods.
- Provide functionality to report the degree of a selected mood.
- Provide an overview where the user can see statistics of their previously reported mood.
- Provide a button for the user to seek professional support.
- Provide reminders for the user to track their mood.

The non-functional requirements:

- The interface needs to be aesthetically pleasing to the users.
- All the main functionalities should be placed within the "thumb zone"(shown as the green area in figure 4), making it easily accessible for the users to reach with minimum effort.

4.3.4 Sketches and wire framing

As seen in figure 5, initial sketches were made based on the findings from the literature review. Three main functionalities were identified and set as the initial requirements for the interface; 1) mood tracking, 2) being able to see statistics of previously tracked mood, and 3) the possibility to contact professionals. The first picture in figure 5, shows the front page with a main menu containing a circle with an emoji in the middle to go

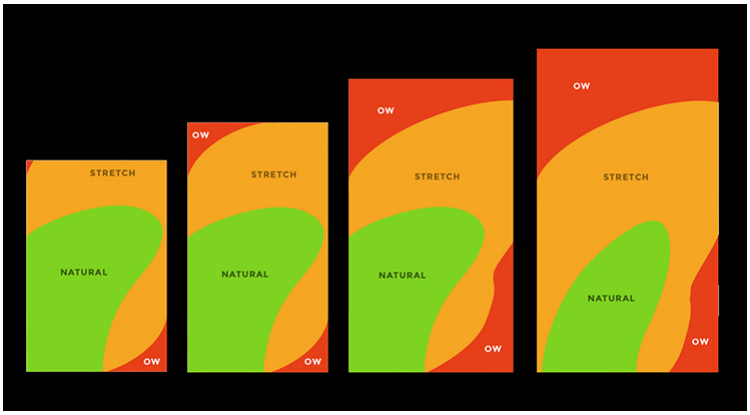


Figure 4: The Thumb zone (Sudeshna, 2019).

to the mood tracking functionality. In addition, a bar chart icon was made down to the left in the main menu to represent the 'statistics' functionality, and a message bubble down to the right, representing the possibility to contact professionals. The next two pictures represents the way of tracking mood, where users can select the desired mood from a list, and later apply the degree on a slide bar with an animation corresponding to the degree.

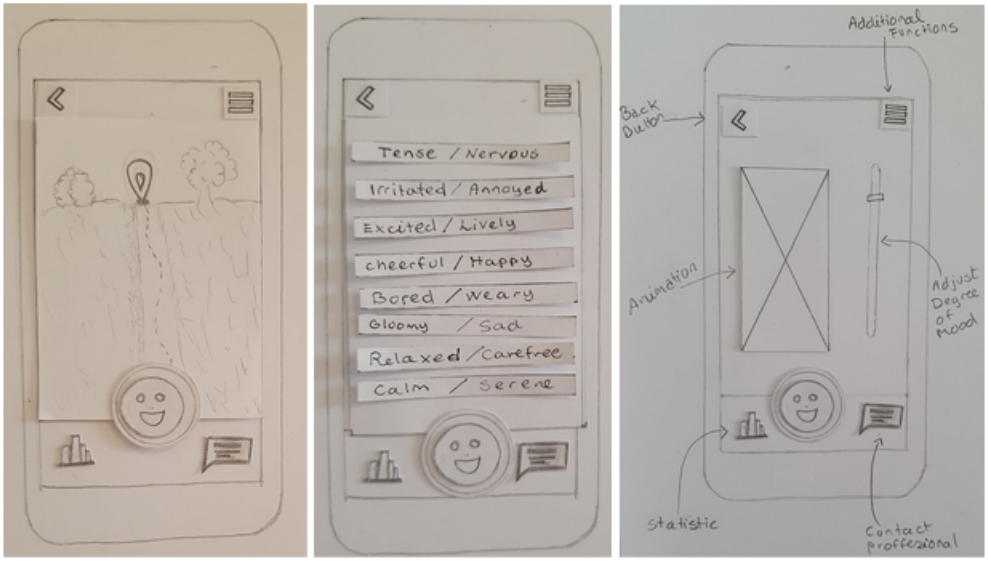


Figure 5: Demonstration of initial sketches and wire framing.

4.3.5 Persona

A persona called 'Simen Johansen', figure 6, was developed using simple html and css. 'Simen' was created to help guide the design work of the mood tracking app by representing the user group.

4.3.6 Conceptual design

Based on the insight gained from the literature review, and the created persona, a conceptual design was made with draw.io to get an overview over which interactions the user could perform with the intended product, figure 7.

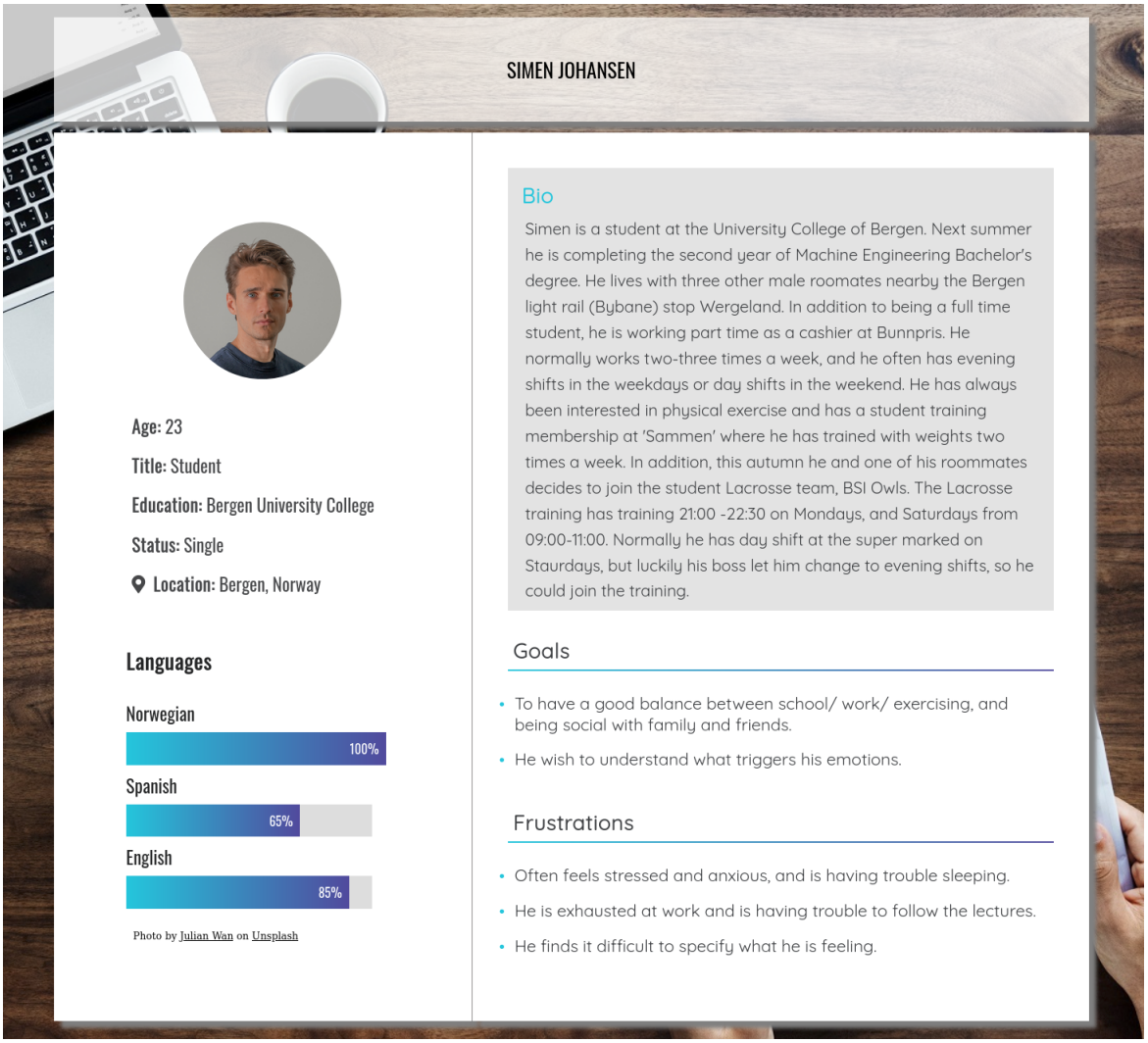


Figure 6: Persona that guided the design process. Photo used for avatar of 'Simen', retrieved from Unsplash, made by Julian Wan (2019).

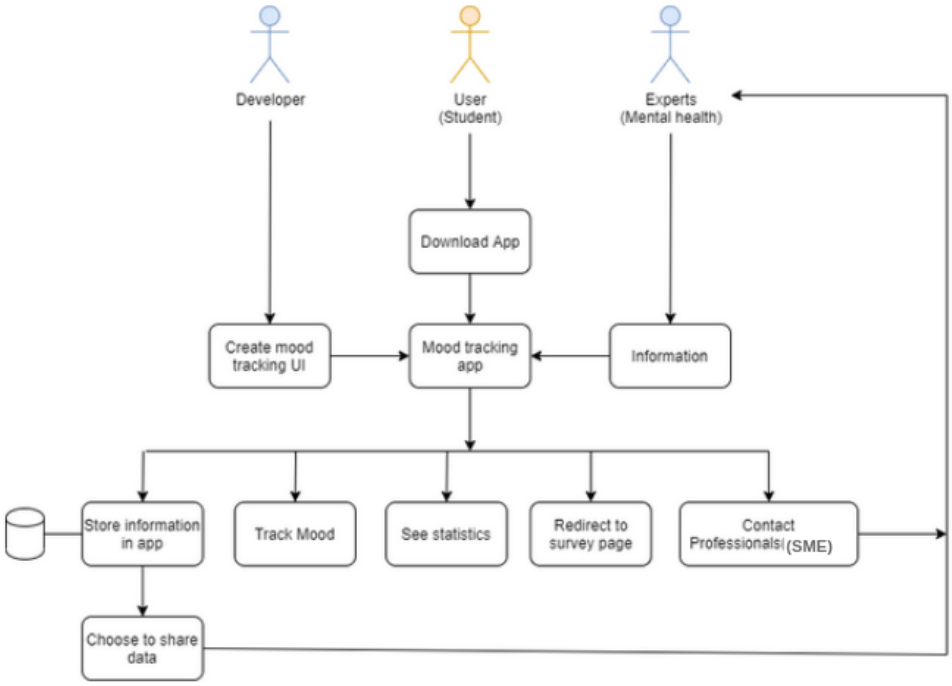


Figure 7: Outline of how users can interact with the intended product

4.3.7 Use Case

A simple use case was made to demonstrate how a user will navigate when the user goal is to track mood in the mood tracking interface. This user goal was chosen because it constitutes the main functionality of the interface. The use case:

1. The user opens the app by clicking the app icon.
2. The user clicks on the mood tracking button.
3. The user clicks on the emotion in the list (s)he wants to track.
4. The user adjust the slide bar to the degree (s)he wants to track.

4.3.8 Feedback from mental health experts

The goal of the feedback was to establish common ground around the intentions of the interface, and to get feedback on initial sketches and ideas for the interface seen from a psychological perspective.

Participants A psychologist in the SME, and their research coordinator gave feedback on psychological aspects of the interface.

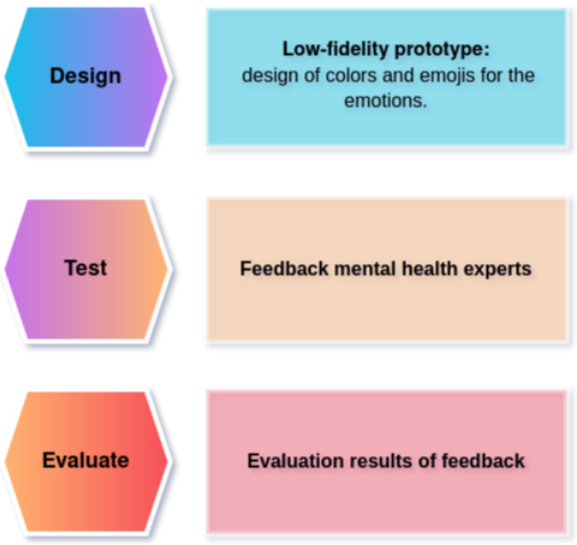
Video meetings When the testing took place, the Norwegian government had ordered national restrictions on physical meetings as a measure to prevent the spread of virus during the covid-19 pandemic. The meetings were therefore held on video. Different alternatives for functionalities to track mood were discussed. However, it was determined to explore a solution where the user could pick mood by swiping inside the emoji circle to switch mood, as shown in the first picture in figure 5. The assumption was made that this method to select something could be easy for the users, since it reminds of *Snapchats* filter picking, with which many students are familiar. With this new idea of choosing mood, I was inspired to discard the last two pictures in figure 5. A new idea came to mind of applying the degree of the picked mood by touching and holding on the emoji you have swiped to. The idea was that the touch and hold action will trigger the circle around the emoji to fill up with color until the degree corresponding to how long you press and hold. The psychologist pointed out that the bar chart icon for the statistics function could be interpreted negative. This symbol could make users feel like 'just another number', and should therefore be replaced by something giving the users a more positive feeling. The message bubble icon demonstrating the contact function, should for now be replaced with the SME's company logo, so the users could go directly to their website. In addition, I got feedback that the degree/intensity scale of emotions should be ranging from 1-7.

4.3.9 Evaluation and new requirements

The feedback laid ground for adding new requirements for the interface design;

- Users should select the mood by swiping on the emoji inside the circle.
- Users should select the degree/intensity of the emotion on a scale from 1-7.
- The statistics icon should be represented by a symbol that gives a positive feeling.
- The contact function should be represented by the SME's company logo.

4.4 Iteration 1



In the first iteration a low fidelity prototype was created based on the feedback to the initial sketches. The goal of this iteration was to determine colors and emojis for the different emotions in the app. The prototype was evaluated by mental health experts at a design workshop at the SME.

Figure 8: Overview of design iteration.

4.4.1 Emotions and colors

First, sketches of how the different moods should be presented with respect to colors and emojis were explored, figure 10. The different moods proposed by Desmet et al. (2012) were used as a starting point for emotions that the user could select between. The moods are based on Watson and Tellegens(1985) categorization of dividing moods into four categories. As seen in figure 9, there are two specters; one reaching from calm to energized, the other from unpleasant to pleasant. This two scales create four categories; unpleasant and energized, pleasant and energized, unpleasant and calm, and pleasant and calm. From this Desmet et al., have defined the following eight moods; tense/nervous, irritated/annoyed, excited/lively, cheerful/happy, relaxed/carefree, and calm/serene. When drawing emojis to fit the emotions, figure 10, it was discovered that it might be difficult for the users to separate the moods relaxed/carefree, and calm/serene. This resulted in one emoji being designed to represent both moods.

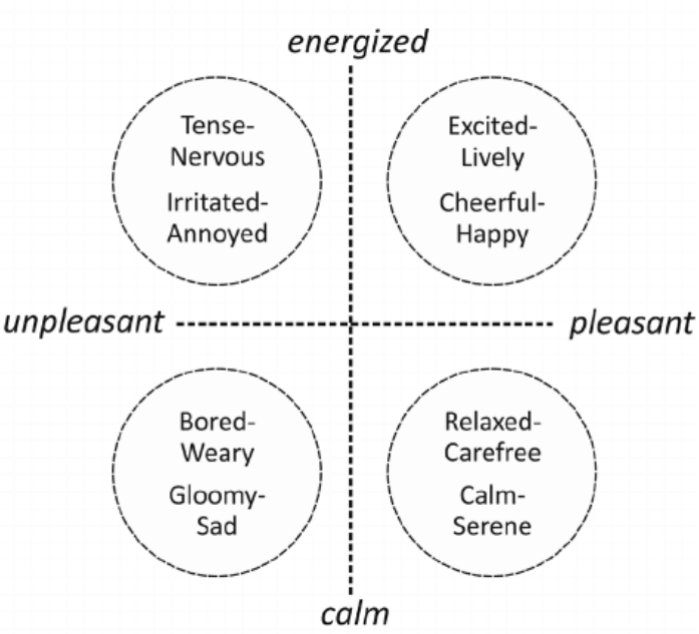


Figure 9: Mood categories proposed by Desmet et al. (2012).

Color Psychology Even though the area of color psychology in general lacks research, it has become a very hot topic in business when it comes to marketing and design (Cherry, 2020c). Despite the lack of research, they have found indications that how people feel about color is often deeply personal and dependent on a persons experience and culture. A study by Kaya and Epps (2004), investigating students color-emotion associations, found that while some students associated the color black with "power," because it reminded them of nice sport cars, some were reminded of "fashion and clothing", while another student said the color black made him sad because it reminded him of "funerals where people wear black".

Choice of colors The following colors were chosen as a starting point for the interface. The color grey/black could be associated with sadness, and was therefore chosen to represent the emotions *Sad/Gloomy*. In the study of Sandford (2014), they looked at the most named emotions/feelings of a color, where sadness was the feeling most users mentioned for both the color grey(77%) and black(57%). The most mentioned emotion for the color red was anger(45%), this could be related to irritation, and was therefore applied to the Irritated/Annoyed emoji. Blue is a color that could be

suitable both for Relaxed/Carefree and Calm/Serene. It can be associated with calmness or serenity, and is often described as peaceful, tranquil, secure, and orderly (Cherry, 2020a). In Sandford (2014), calmness was the most named emotion for the color blue.

Yellow is often used by advertisers to draw attention, and to evoke a sense of happiness (Cherry, 2020b). It can be interpreted as a bright and cheerful color, and happiness was the feeling mentioned by most(69%) for the color yellow in Sandfords study (Sandford, 2014). Thus it was applied for the emotion Cheerful/Happy. Since the color orange calls to mind feelings of excitement, enthusiasm, and warmth (Cherry, 2019), it was applied to the emotion Excited/Lively. In Sandfords study, energetic was ranked the most(30%) named feeling for orange, followed by happiness(29%), and excitement(15%). For the emotion Tense/nervous, the color green was chosen because feeling tense/nervous could be associated with feeling sick or having the need to vomit.

Having applied the previously colors to the other emotions, it was not so easy to find a suitable color for the emotion Bored/Weary. In Sandford's study the color purple was one of the top five colors when participants were asked which color they associated with boredom. However, only 4 % responded this, so the main reason for choosing the color purple for this emotion was because it was considered to fit well with the other colors.

However, as earlier mentioned, how humans perceive colors are fairly subjective, thus how the users interpret the colors can be very differently from what is stated here. This needs to be tested with users in order to see how they perceive it.

4.4.2 Low-fidelity prototype

A low-fidelity prototype was created using Vue.js. As seen in figure 11, icons from Font Awesome were used for the emojis and the colors from the color exploration were applied to the emojis, and in the circle around the emoji. Here the examples shows that four pieces of the circle are filled with color, indicating the intensity/degree of emotion set to four. The color blue was chosen as the app main color, because it has shown to communicate trust (Van der Geest and Wounter A., 2011). As mentioned in the

Figure 10: Sketches of colors and emojis of different moods. The last emoji was created to represent both relaxed/carefree and calm/serene

literature review, Olff (2015) stated that users trusting the application is essential for their willingness to use it.

The bar-chart icon for the 'statistics' functionality was replaced with a heart icon with a pulse on it, and the message bubble for contacting professionals was replaced with the SME's logo with a link to their website. The captions 'Statistics' and 'Contact' were added to the icons. The heart with a puls sign is often used for statistics on health data, however, the SME's logo is not a universal sign for contact, so this was done in order to avoid confusion. As seen in figure 12, two different design alternatives for captions of the moods were made. This was done because people tend to interpret emojis very differently, and not applying captions might therefore confuse the users.

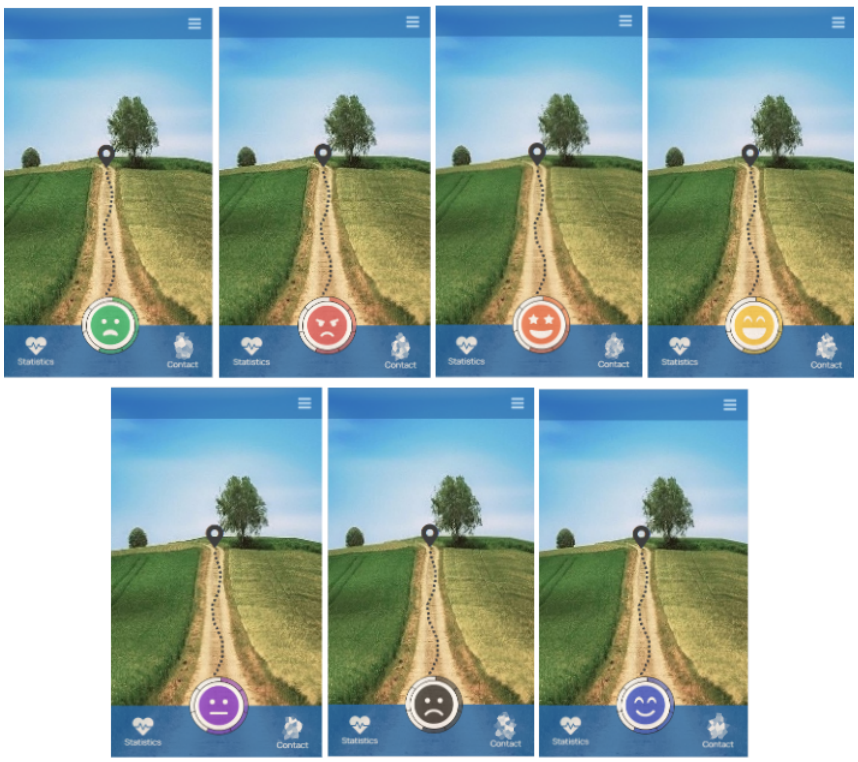


Figure 11: Low-fidelity prototype showing the seven different moods where intensity/degree of emotion is selected to 4.

4.4.3 Use Case

The use case was updated with the new way of tracking mood:

1. The user opens the app by clicking the app icon.
2. The user swipes to the mood (s)he wants to track.
3. The user clicks and holds on the emoji until the circle around the emoji is filled up to the intensity/degree of emotion (s)he wants to track.
4. The user gets a dialogue box to confirm or cancel the tracking. Alternative courses:
   (a) The user clicks 'confirm'
   (b) The user clicks 'cancel' $\longrightarrow$ mood tracking process canceled.
5. The user gets feedback on the mood tracking.
   (a) Feedback indicates to the user that the mood tracking was successfully completed.

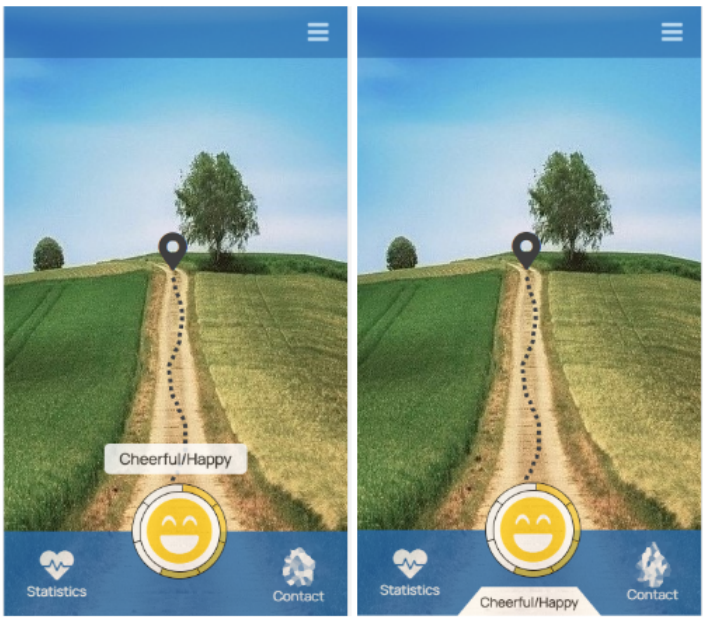


Figure 12: Two alternatives for mood captions.

4.4.4 Design Workshop and feedback from mental health experts

The goal of the feedback was to determine the emotions that the users can choose between, and colors and emojis to represent the different emotions.

Participants A psychologist, a research coordinator, a developer, and two interns at the SME gave feedback on the low-fidelity design of the interface.

Design workshop A design workshop was held at SME's office. The design of the low-fidelity prototype was demonstrated to the group. Feedback was given by the psychologist on the choice of emojis and colors for the different moods, where I got feedback that the colors I had selected were suitable. In addition, it was confirmed that the last to emotions 'Relaxed/carefree' and 'Calm/Serene' could indeed be merged into one mood, but they stressed the fact that this should be 'Relaxed/Calm', since the word carefree is often interpreted as negative. It was determined to use the second alternative in figure 12, where captions were applied as an integration of the main menu. Suggestions were proposed to add several background photos, so the user can personalize the app by customizing the background. Regarding the statistics page, we

discussed different possibilities for data visualizations of the mood trackings, such as showing different emotions in a bar chart, a calendar of tracked mood and activities, time active, and how many times you have tracked mood. In the end of the workshop, future aspects of the app were discussed, such as which settings are necessary, and the use of gamification. However, this research will focus solely on the mood tracking part of the app.

4.4.5 Evaluation and new requirements

Based on the feedback from the mental health experts regarding emotions, suggestion of personalization, and discussion around the statistics page, new requirements were set for the interface:

- Users should be able to select between the following seven different emotions with the corresponding colors:
  - Tense/Nervous (Green)
  - Irritated/Annoyed (Red)
  - Excited/Lively (Orange)
  - Cheerful/Happy (Yellow)
  - Bored/Weary (Purple)
  - Gloomy/Sad (Grey/Black)
  - Relaxed/Calm (Blue)
- Emoji captions should be integrated in the main menu.
- Users should be able to choose between four background photos.
- The statistics page should show a calendar where users could:
  - See an overview of the mood tracking for a month.
  - See a detail view of mood trackings for a day when clicking on a date.

4.5 Iteration 2

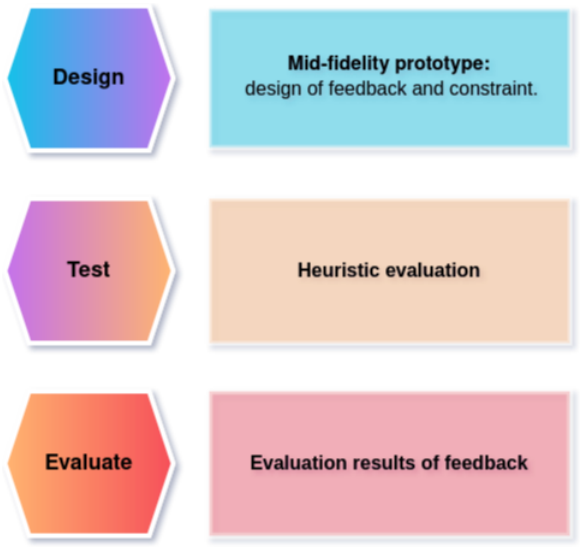


Figure 13: Overview of design iteration.

In the second iteration a mid-fidelity prototype was created by adding interactivity, and implementing the new requirements based on the feedback from the mental health experts in the previous iteration. In addition, feedback and constraints were designed. The goal of this design iteration was to determine feedback and constraints in the interface, and to solve easily spottable errors. In order to not waste user participants on simple mistakes, the mid-fidelity prototype was evaluated heuristically by usability experts.

4.5.1 Mid-fidelity prototype

Based on the new requirements, a mid fidelity prototype was developed. Functionality to choose background image was added, were the user could choose between four different photos, figure 14 and figure 15. In addition, interactivity was added to the prototypes main functionality, which made it possible to swipe inside the emoji circle to select mood, and touch and hold to select the degree. As seen in Figure 16, after the touch hold event stopped, a dialog box was shown, were the user got an overview of which mood they have selected, and which degree they have applied. The user further got the options to cancel the mood tracking, or confirm. When confirming, a feedback dialog was displayed informing the user that the mood was in fact tracked, and that they could see all their tracked mood in 'Statistics'.

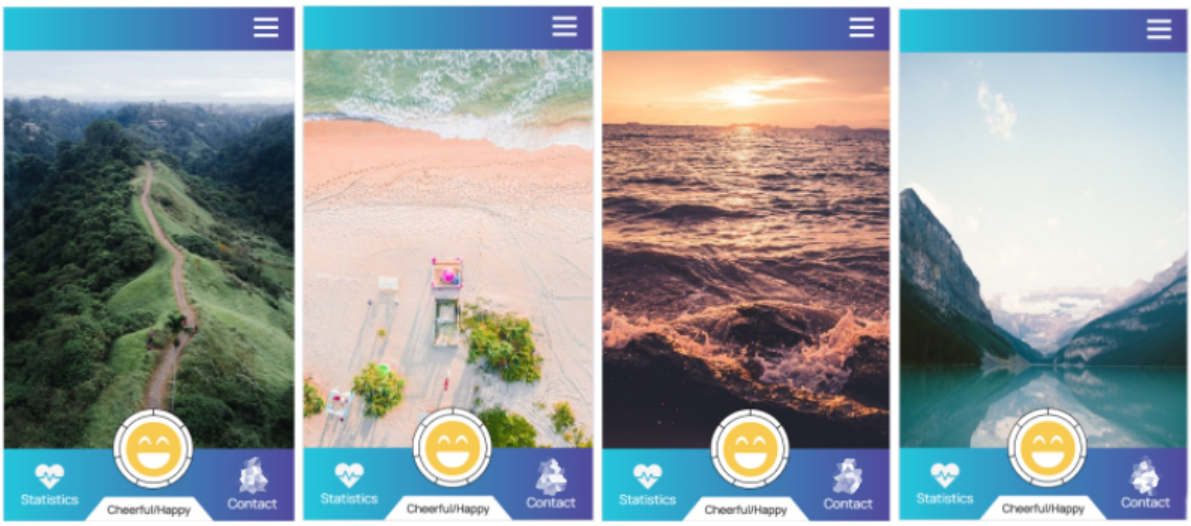


Figure 14: Frontpage with different background photos.

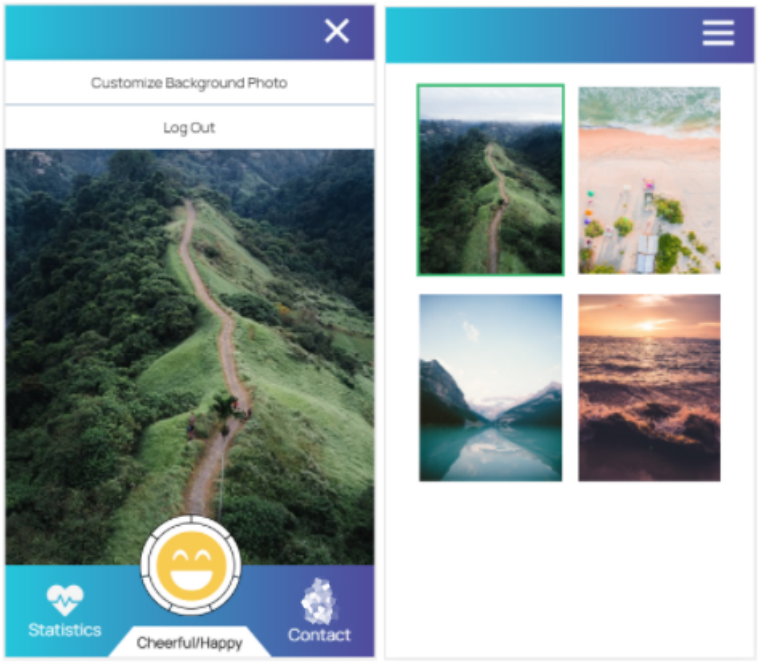


Figure 15: Background image picker.

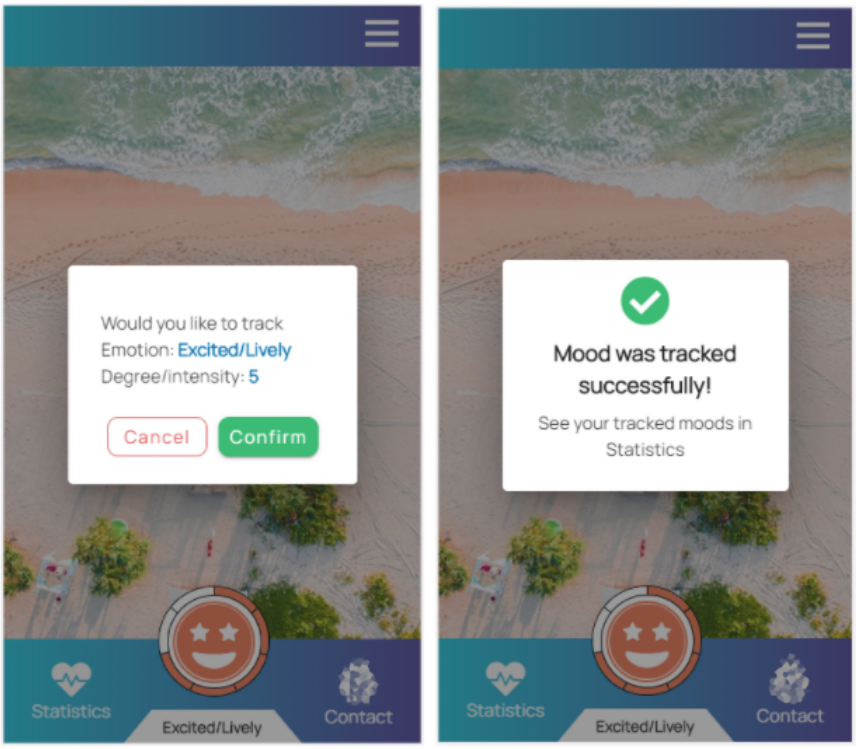


Figure 16: Functionality to add mood.

Navigating to 'Statistics', the users could see an overview underneath the calendar showing the tracked moods that month, and by clicking on a date in the calendar, they got a detailed view of mood tracking(s) the selected day, Figure 17. In the detail view, they could click the 'trash' icon on a mood tracking item to delete it. Thus implementing the principle of perceived affordance. When hitting the icon, the users see a dialog where they can cancel or confirm the deletion, Figure 18. If they confirm, the mood tracking disappears from the list.

In addition, functionality to login/logout was implemented for test purposes. The possibility to add notes was implemented, but later removed due to considerations of the General Data Protection Regulation (GDPR). This was done to avoid the risk of students writing personal identifiable notes, in case a hacker would enter the system. Thus, the functionality was removed before testing.

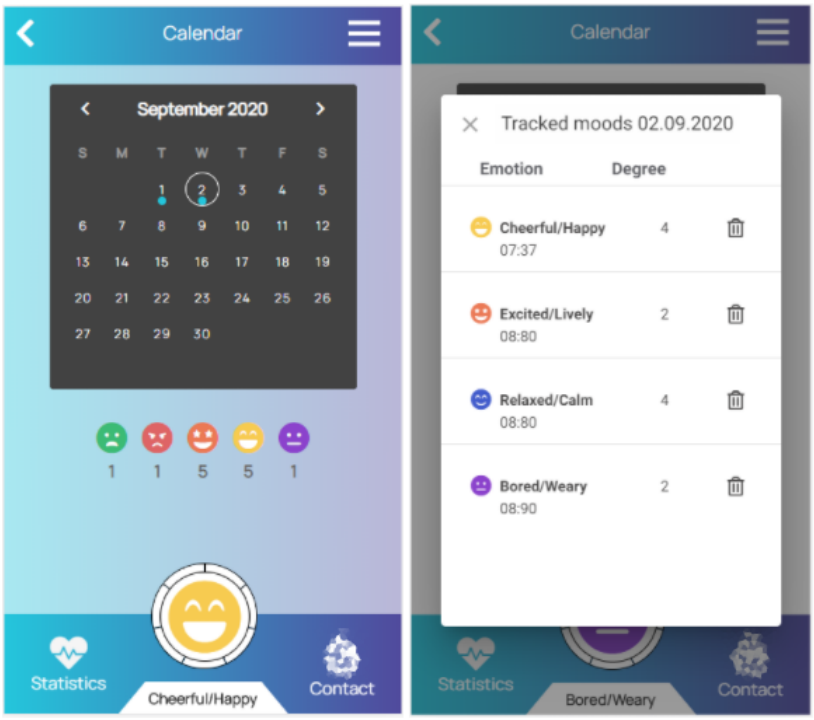


Figure 17: Statistic page showing calendar with overview over moods the current month. In addition, a detail view of mood trackings for a day, when user selects a date in the calendar.

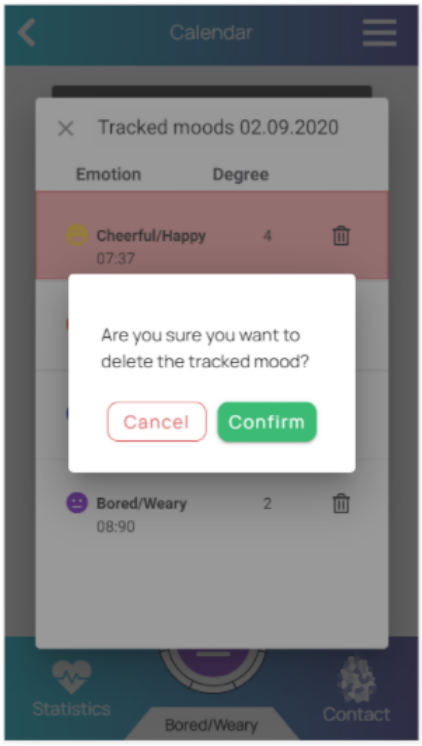


Figure 18: Functionality to delete mood.

4.5.2 Heuristic evaluation with usability experts

The goal of this evaluation was to determine feedback and constraints in the app, and to solve most issues before testing the interface with users. The mid-fidelity prototype was heuristically evaluated by three usability experts. All experts where given a link to the deployed design and credentials to log in. Since the app was web based, the experts where told to log into a browser on their mobile phone. The evaluations where done on a mobile phone in order to get a more realistic feeling by testing on an intended device.

Participants All three experts were female. The first expert was a Phd candidate and instructor in Interaction Design. The second expert was a digital consultant working in a team responsible for IT systems at Bergen public Library. She especially works with the children's department to see if it is user-friendly for employees and library users. The third expert has been a lab assistant in interaction design courses, and works part time as a designer.

Semi-structured interviews Two of the tests were performed as a semi structured interviews, where I had a meeting with the experts in person. This gave a lot of insight, since it was possible to observe the experts when they navigated the app, and the experts had a discussion afterwards. The third expert did the evaluation remotely with the same tasks and questions, see appendix A.

Mood tracking When testing the mood tracking, the experts found that it is not clear to the user how to track mood. One expert wanted to click the emoji button instead of swiping it, another struggeled to understand how to change between moods. The result of how to apply intensity/degree was the same. All answered that there is a high risk that the user will apply the wrong degree/intensity of a mood. Instead of performing touch and hold on the emoji, experts tried to click it, and it took time before they figured it out. Even when knowing how to apply degree, it still was difficult, due to their thumb being in the way of seeing the circle filling up with color. They stressed the fact that the button was too small, which made it difficult to see what they were doing.

The answers were quite ambiguous when the experts were asked whether the app would inform students about what is going on through appropriate feedback when tracking their mood. One expert answered not really, another that it could be more clear but the change of caption underneath while swiping was nice, while the third was happy with the feedback when she had figured out the way to select mood and apply degree. The experts found that it is possible for the user to go back if they accidentally apply the wrong degree. However, one expert pointed out that they cannot adjust it, but rather click cancel and apply the degree once more. Further, the feedback showed that the statistic icon is very intuitive for the users, however the contact icon is not intuitive.

Statistics On the statistics page, all expert agreed that it was clear for the user how to see previously tracked mood for a specific day, and how to see previously tracked mood for a specific month. However, the experts thought the month overview showed the number of times a user had tracked a specific emotion. The view actually showed the summed up degrees for an emotion that month, and not the total number of mood trackings. One of the experts was informed of this, and changed her answer. She gave the suggestion of showing how many times you have tracked an emotion, and rather apply the degree average of the trackings in a circle around the number if desired.

All experts thought it was clear to the users how to do delete previously tracked mood, and that it was clear how to change background photo. However, one of the experts noticed that you cannot go back when entered the background image picker without choosing a photo first.

In the end, some more general questions about the app were asked such as how the app made them feel, if the language in the app was understandable to students and what they would like to change in the app. On how they felt, one expert pointed out she felt good because of the beautiful pictures, another that she felt it was challenging to see how to select mood and log intensity, and the third that she did not feel anything specific, but considered the app nice and minimalistic. All experts evaluated the words and terms used in the app to be familiar to students.

Suggestions The experts came with several suggestions. In the main menu they suggested to make the mood tracking button bigger, and add a "Select mood" caption to better inform the user of what it does. The contact icon was suggested to be changed for an icon that people are used to. For the selection of moods, they expected the positive and negative emotions to be grouped together. The current way of selecting mood made it difficult for the user to see what they could choose between. To address this issue, one expert suggested to make an overview over all the moods. Regarding the functionality to apply degree, they suggested to make adjustment arrows on the confirmation bubble for the user to be able to correct the degree if s(he) accidentally applied the wrong one. In general, they suggested to make the touch elements size bigger, the touch zone a bit bigger than the elements size, and when the user clicks outside a dialog box it should close (One dialog did not fulfill this in the test).

4.5.3 Evaluation and new requirements

Consulting the usability experts gave very valuable insights that resulted in new requirements being defined for the mood tracking interface:

- The mood tracking button should contain a label/text, so it is completely clear to the user what it does.
- Remove mood tracker from statistic page.
- Make the user see an overview over the moods to select between.
- Make the touch elements size bigger and the touch zone a bit bigger than their size
- Fix how to track degrees.
- Group emotions in positive and negative emotions
- If you click outside the dialog box, you should be able to close the dialog.
- Monthly overview of moods: Show how many times you have tracked for instance happy.
- Change the icon for contact to an icon people associate with contact.
- Show average degree of the trackings in a circle around the number of trackings in monthly mood overview.

4.6 Iteration 3

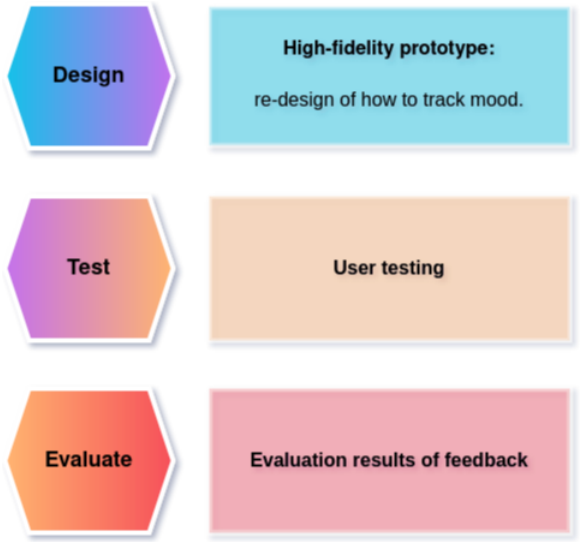


Figure 19: Overview of design iteration.

In this iteration, a high-fidelity prototype was designed based on the feedback from the usability experts in the previous design iteration. The goal of this iteration was to explore how students perceive the mood tracking interface. The high-fidelity prototype was evaluated with users through usability testing, and unstructured interviews.

4.6.1 High-fidelity prototype

As seen in table 7, an overview of the tasks were organized by marking them with a priority level and a difficulty level. This was done in order to make a prioritized list of which changes had to be done, should be done, and which changes could be done if time. In this iteration a lot of work and effort was done to integrate the mood tracking interface into an open source questionnaire app.

Open source project The mood tracking interface was integrated into an open source project, created by Mukhiya et al. (2021). The project was initially made as a self-assessment psychometric questionnaire app, however, the idea is for the app to be flexible to use for multiple purposes, in different fields. For instance, for psychologists to be able to send questionnaires to their patients in order to map their moods. The open source project has focused on making the architecture well fitted for other contributors to easily add new modules. The backend was extended with new modules to support the actions of tracking, retrieving, and deleting mood in the interface. To make it possible to integrate the frontend of the mood tracking interface, the code had to be rewritten from Vue.js to React Native. Both Frameworks are JavaScript based,

however, the previously version with Vue.js was web-based, not native. Using a native framework made it easier to fit the design for different sized mobile phones, and the mood tracking interface was developed for both Android and iPhone(iOS) platform.

Table 7: Overview of priority level and difficulty level of tasks.

Tasks	**Priority**	**Difficulty**
The mood tracking button should contain a label/text.	High	Low
Make the user see an overview over the moods to select between.	High	High
Make the touch elements size bigger and the touch zone a bit bigger than their size.	High	Low
Fix how to track degrees.	High	Medium
Remove mood tracker from statistic page.	Medium	Low
Group emotions, positive/negative.	Medium	Low
If you click outside the dialog box, you should be able to close the dialog.	Medium	Low
Monthly overview of moods: Show how many times you have tracked for instance happy.	Medium	Low
Change the icon for contact to an icon people associate with contact.	Medium	Low
Show average degree of the trackings in a circle around the number of trackings in monthly mood overview.	Low	High

Testing instance An instance of the open source app was made in order to customize it for test purposes. In the testing instance, it was possible to access the mood tracking interface by hitting the 'Track Mood' button on the open source app front page, or by clicking the 'Mood Tracking' tab after opening the menu drawer, figure 20. The title of the app was renamed to 'MoodTracking' to not confuse the test participants of the purpose of the user test.

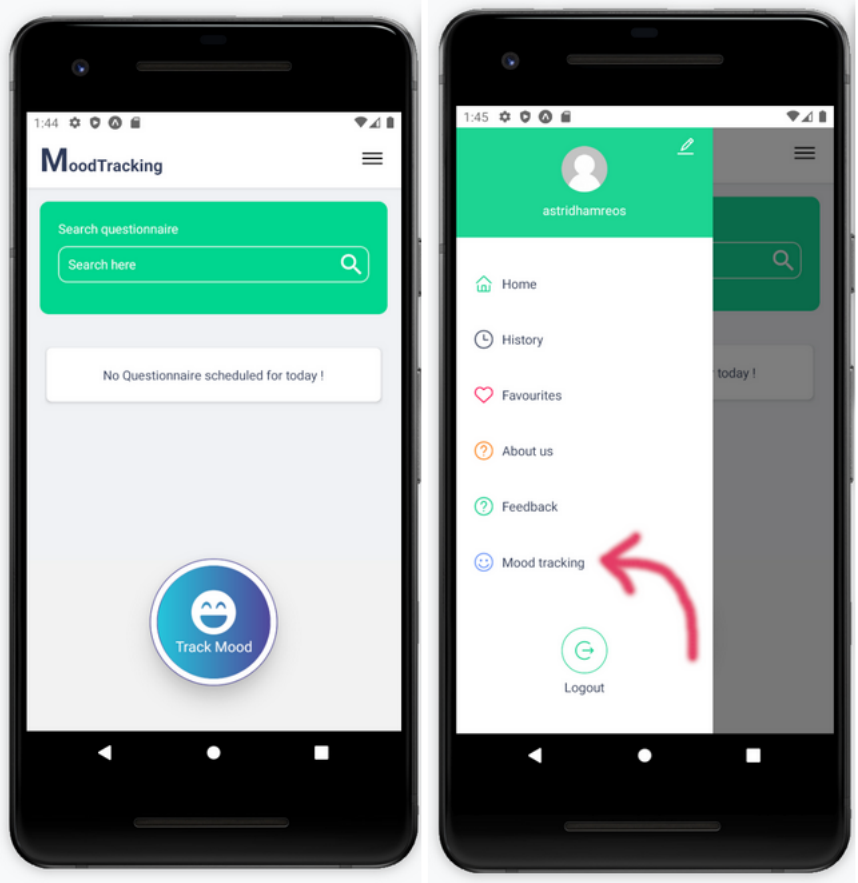


Figure 20: Integration into open source app.

Main menu On the front page of the mood tracking interface, figure 21, the mood tracking button was changed by making it bigger, and adding a caption to make it clear what it does. An emoji icon was added to make the button more appealing to the users. In addition, the contact icon was changed with an 'Info' icon leading the user to an 'About us' page in the open source app.

Background photo picker Since, at the time being, there are not any more settings in the app, the intermediate step to choose change background image was removed. The image picker was shown directly when clicking the menu icon. This solved the problem of the users earlier being forced to choose a picture to exit the menu.

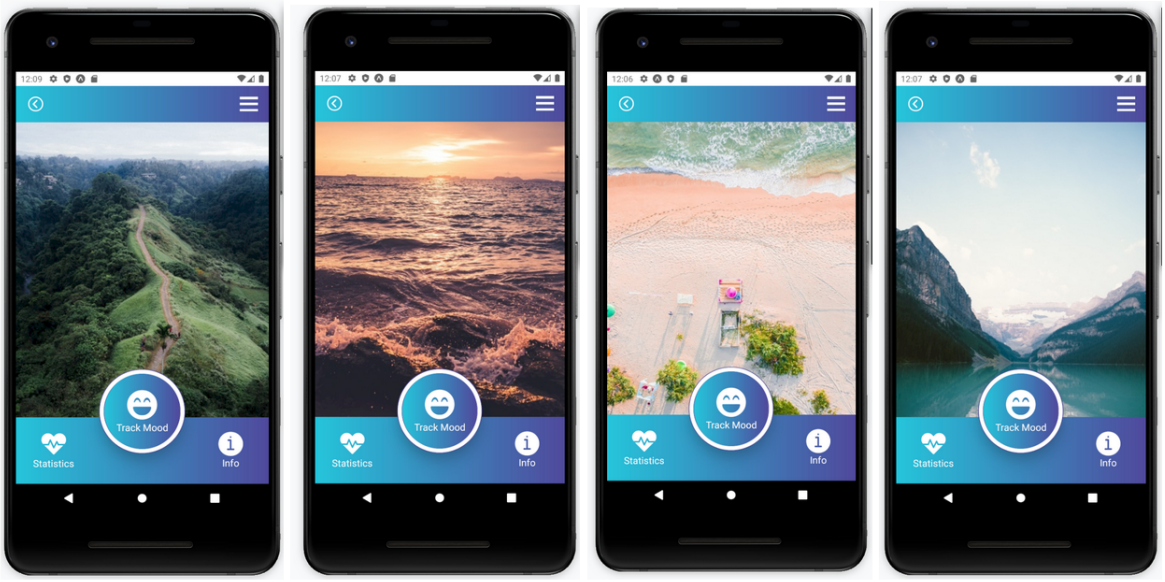


Figure 21: Front page.

Mood tracking Following the new requirements, an overview over all moods to select between was displayed for the users when hitting the 'Track Mood' button, figure 22. If the user hit the 'Track' button inside the mood overview without selecting a mood first, the message: 'Select the mood you want to track first" is displayed. This helps the user to avoid making a mistake, thus implementing the design principle of constraint.

When selecting an emoji, the mood tracking info inside the overview changes from 'no mood selected' to the caption of the emotion the user select, giving the user visual feedback. In figure 23, an example of tracking the emotion 'Excited/Lively' on iPhone is displayed. The users could select the degree of the emotion on a slide bar (iPhone) or by clicking on the arrows(Android), see the first picture in figure 22. There were three options to choose between; 'A little', 'Somewhat', and 'Very'. This change was made since the usability experts pointed out that it could be difficult for the users to select degree 1-7. In the example, they would for instance get: *I feel... Somewhat Excited/Lively.* This might feel like a more human way of expressing how you feel than selecting a number.

Figure 22: Mood overview on Android(1) and iPhone(2), and the message 'Select the mood you want to track first' being displayed(3) when the user clicks 'Track' without having selected a mood.

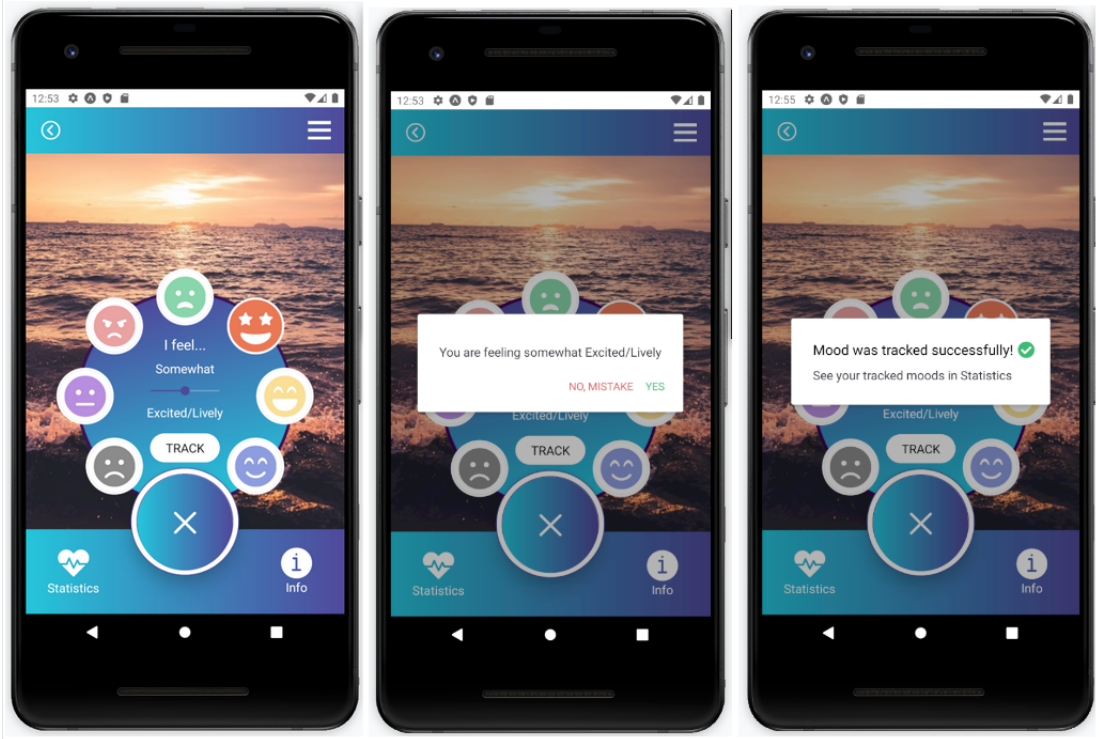


Figure 23: The process of tracking "somewhat Excited/Lively" on iPhone.

Statistics page On the statistics page, see figure 25, the mood tracking button was removed since it is not necessary to access it here. The button was replaced with a button back to the front page where one can track mood. In addition, a white line was added underneath the statistic icon to give a navigation indicator/visual cue to the users that they are at the statistics page. The calendar text in the top menu was removed since the focus of the navigation should be centered to the main menu, applying the principle of an aesthetic and minimalist design. Otherwise the menu stayed the same as on the front page, to keep consistency in the app. Figure 24, shows how the statistics page look when no data is tracked, displaying the following message to the user *"You have no mood trackings for this month yet'*, and when a user selects a date, the dialog shows *'There are no tracked mood on the day you have selected'*, thus applying the principle of feedback. Regarding the process of deleting mood, figure 26, the dialog buttons were changed from *cancel* and *confirm* to *No, mistake* and *Yes* to keep consistency with the changes made in the confirmation dialog when tracking mood.

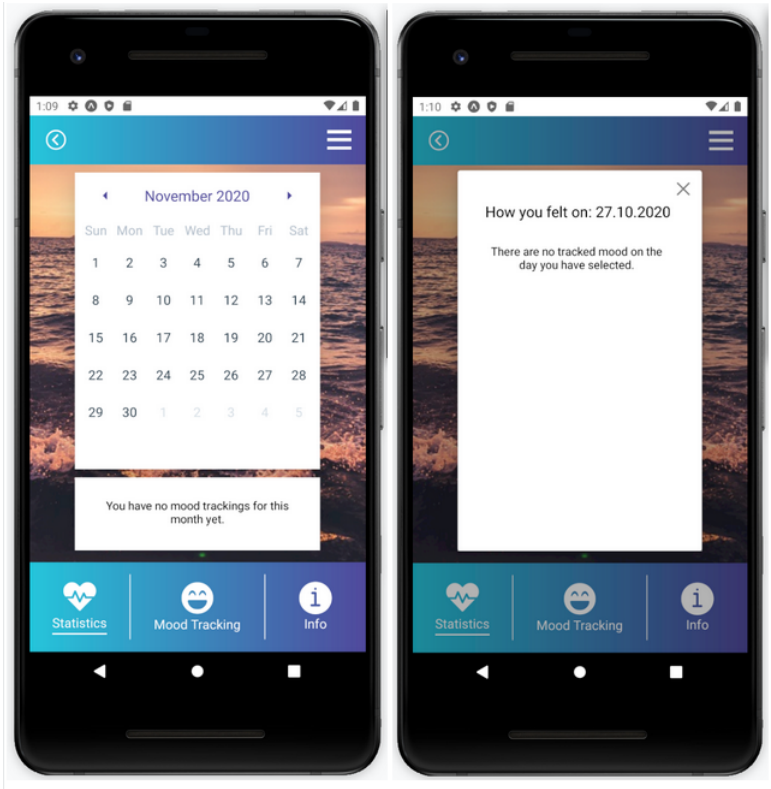


Figure 24: Statistics page no data.

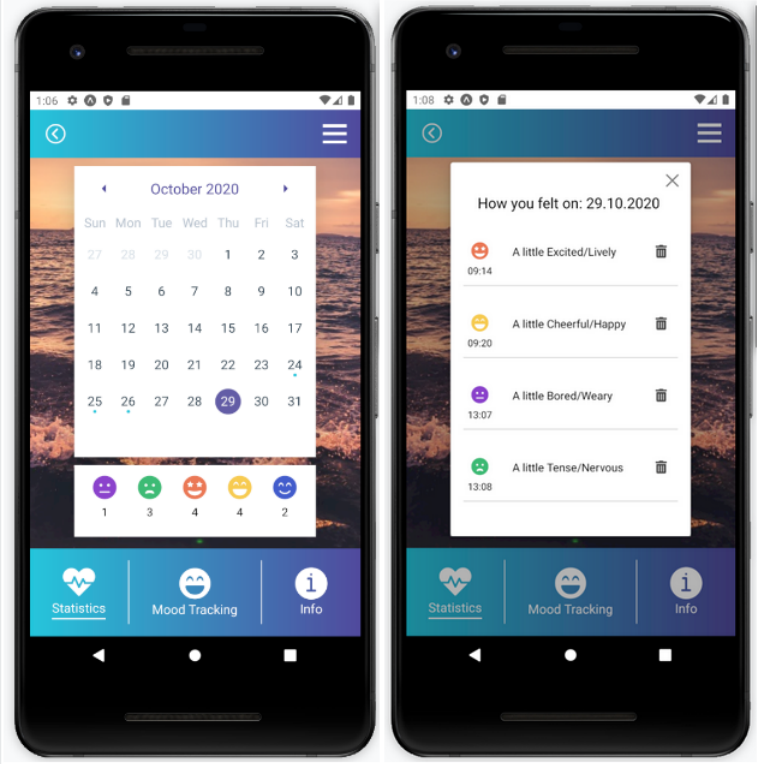


Figure 25: Statistics page.

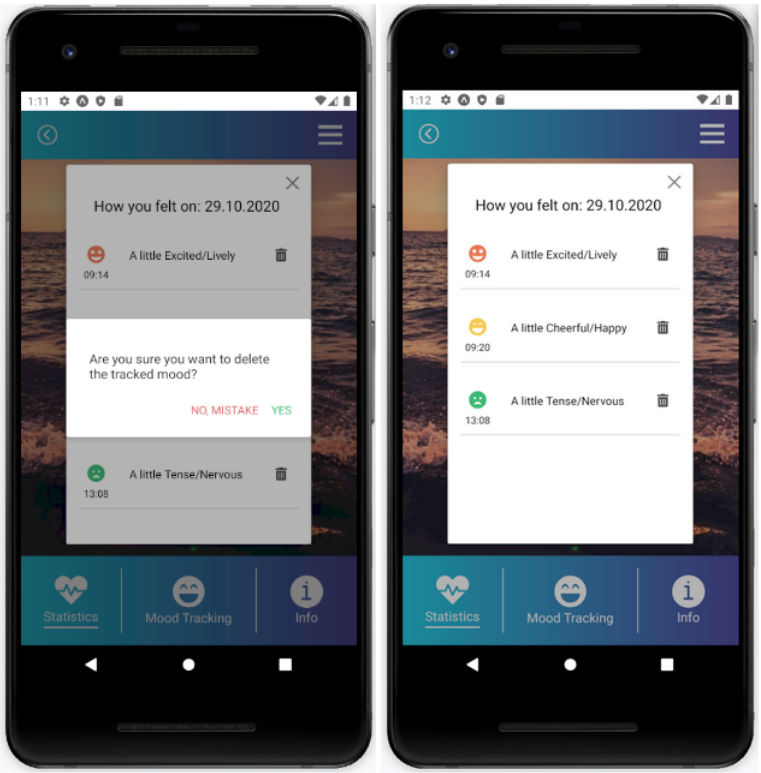


Figure 26: The process of deleting mood.

Notifications Reminders in the form of notifications were created for the users to receive in testing. The content of the notification was a result of a discussion where I got feedback from a usability expert. I sent the usability expert two alternatives as a starting point:

1st alternative: *MoodTracking Har du husket å logge humøret ditt?*
2nd alternative: *MoodTracking Hvordan føler du deg nå?*

It was discussed that the 1st alternative might be misinterpreted by the users. When they get the same notification later the same day, they might think they have already done it for the day, and not bother to track mood again. The usability expert pointed out that the app name always appears on top of the message, thus it was redundant to have this in the title as well. In addition, using the Norwegian word 'logge' did not sound good. Thus, the notification lowest in figure 27, was discarded, and a new notification was sent using the word 'track' instead (the one in the middle). Putting a exclamation mark behind the text, seemed a bit to commanding, resulting in the latest notification seen at the top in the picture stating: *Hvordan føler du deg nå? Track humøret ditt i appen.*

Figure 27: Notifications

App icon Following the principle of consistency, the app icon was made with the same mood tracking icon, and the same gradient color as the app interface, figure 28. The app name was set to be 'MoodTracking'. However, it was later discovered that the name had too many characters for iPhone. As seen in the notifications, figure 27, the name was cut off to only show 'Mood'. Thus, the name should be changed in the future to fit the iPhone app name requirements.

Figure 28: App icon

4.6.2 Updated use case

The use case that was created in the 1st design iteration was updated with the new way of tracking mood:

1. The user opens the app by clicking the app icon
2. The user clicks on the 'Track Mood' button.
3. The user clicks on the emoji corresponding to the emotion (s)he wants to track.
4. The user drags the slide bar (iPhone), or clicks on the arrows (Android), to find the desired degree/intensity (s)he wants to track.
5. The user gets a dialogue box to confirm or cancels the tracking. Alternative courses:
   (a) The user clicks 'YES'
   (b) The user clicks 'NO, MISTAKE' $\longrightarrow$ mood tracking process canceled.
6. The user gets feedback on the mood tracking
   (a) Feedback indicates to the user that the mood tracking was successfully completed.

4.6.3 Evaluation with users, Intermediate testing

The goal of the intermediate testing was to explore the usability of the design with a few users to see if the new design was worth building on. Two persons took approximately five minutes to look at the app. Both manged to track mood fine. However, feedback was given from one of the persons that it could be made even clearer which emotion you have selected. Based on this feedback, the opacity of the emojis that are not selected was reduced even more to make the selected emoji stand more out from the rest. One person expressed the desire to be able to choose the emotion tired or sleepy. However, adding an emotion would require a lot of work, and there was simply not sufficient time to do this before the user testing. Thus, it was decided to keep the current emotions, and rather see if this desire was confirmed in the user testing.

4.6.4 Evaluation with users, User testing

The overall goal of the user testing was related to RQ2: *How do students perceive the mood tracking interface?* and RQ4: *What should designers of a mobile mood tracking interface consider, in order to best support an intuitive design to motivate students to track their mood?* More specifically, the testing explored how the students interpreted the different emojis through a design exercise, the usability tests seeked to explore how they interacted with the interface, and the interviews explored more in-depth their user experience.

Participants The target group for the mood tracking interface was youth and young adolescents from the age 16 +, where the intention was to recruit students from both genders, and from different fields of study. A design exercise, a usability test, and unstructured interviews were carried out with classes at Amalie Skram High School. This resulted in including participants that were available rather than selected specifically, also known as convenience sampling.

Test setup Testing in this round was done in cooperation with my co-supervisor's PhD work in micro interaction. We designed a test study together where the plan was for us to arrange two classes at Amalie Skram High School. Due to the pandemic, we had to do the classes digitally on Zoom instead[3]. In figure 29, the plan that was intended to be performed in the two classes is shown.

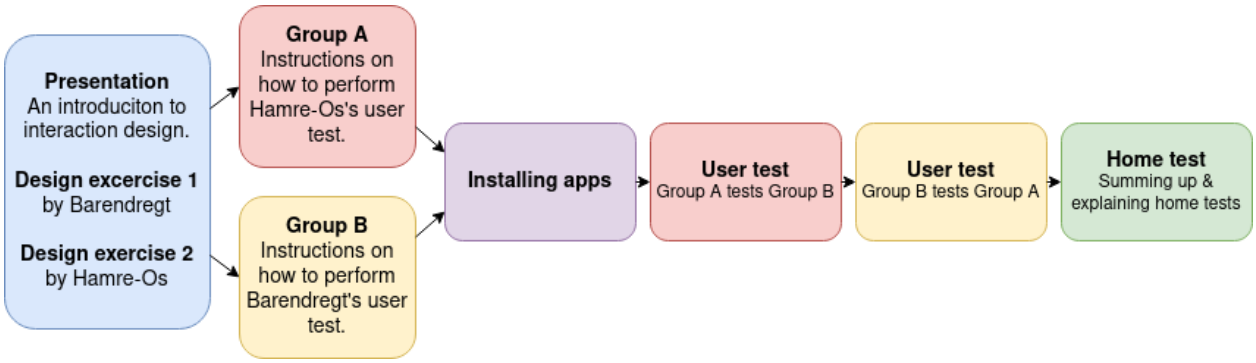


Figure 29: The initial test setup for both classes at Amalie Skram High School.

Design exercise The goal of the design exercise was to see how the users interpreted the emojis used in the interface. The exercise was done by the first class, where a total of ten students filled out the form seen in appendix B. They were given the instruction to brainstorm words that reminded them of the different emojis. If they had written several words on the same emoji, they were instructed to mark the one they considered to be the best fit with a circle around it.

Seeing the students responses of the design exercises, table 8, it seemed to be more difficult for the them to interpret and separate the positive emojis from each other. Regarding the negative feelings, the users were quite agreed on the meaning of *Sad/Gloomy*, *Irritated/Annoyed*, and *Tense/Nervous*. Everyone mentioned the word 'Sad'(10) for the emoji for *Sad/Gloomy*, three mentioned 'bad'(3), and one 'disappointed'(1). For *Irritated/annoyed*, most responded 'angry'(7), some 'mad'(2) and 'pissed off'(2), followed by 'bad'(1), 'irritated'(1), and 'frustrated'(1). One of the users left his/her answer blank. Despite the users appearing to agree upon the interpretation of the *Tense/Nervous* emoji, the users did not interpret the emoji as intended by the

[3]Unfortunately I did not get all the data I hoped for because of covid-19. Restrictions made it impossible for us to be in class and observe the students. In addition, the school experienced technical issues, resulting in only one class performing the design exercise, and one performing the user tests.

text. Six of the users mentioned the word 'afraid'(6), while some mentioned 'disappointed'(3), and a few 'shocked'(2). For the remaining negative emoji, *Bored/Weary*, the answers were quite ambiguous. Three users mentioned 'neutral'(3). Others responded; 'disappointed'(2), 'ok'(2), 'normal'(1),'feel nothing'(1), 'good'(1), 'a bit unsatisfied'(1), 'irritated'(1), 'so so'(1), 'meh'(1), and 'does not have a meaning on the topic'(1).

For the positive feelings, the students had quite similar answers for the emoji for *Relaxed/Calm*, however, they interpreted it to be related to a different emotion than what was intended in the interface. The users related this emoji to the feeling of being Happy(7) or Satisfied(4). One user mentioned the word flirt(1) as well. Regarding the emoji *Excited/Lively*, they disagreed a bit. It was clear that it was difficult for them to separate the emoji from the other positive emotions emojis, since users mentioned the word 'happy'(4) for this emotion as well. Others responded 'cute'(1), 'perfect'(1), pleased (1), 'impressed' (1), 'starstruck'(1), 'excited'(1), 'surprised'(1), 'trippin'(1), 'nerding'(1, had customized the emojis eyes with glasses). On the other hand, for the *Cheerful/Happy* emoji the answers were quite unanimous. All users answered 'happy'(10). In addition, one users also added the word 'funny'(1).

Usability test The goal of the usability test was to observe how the users interact with the app. A total of five user tests were conducted, where the students performed the usability test on each other (after detailed instructions on how to do this). They were given instructions on how to download the apps prior to the test (see Appendix D). Two of the tests were performed on iPhone, and three on Android. Not all of the testers had understood the instructions of noting down observations on the tasks they gave the user. However, everyone responded to the five questions in the questionnaire (see Appendix E). After the test, the students were asked to track their mood at home before the interviews were carried out.

Table 8: Results from design exercise. The numbers behind the words in the second column indicates how many of the 10 participants had mentioned it.

Emoji/description	Words mentioned by the users.
 Sad/Gloomy	Sad(10), Bad(3), disappointed(1).
 Bored/Weary	neutral(3), disappointed(2), ok(2), normal(1), good(1), feel nothing(1), a bit unsatisfied(1), irritated(1), so so(1), meh(1), does not have a meaning on the topic(1).
 Irritated/Annoyed	Angry(7), mad(2), pissed off(2), bad(1), irritated(1), frustrated(1), -Blank answer-(1).
 Tense/Nervous	Afraid(6), Disappointed(3), Shocked(2).
 Excited/Lively	Happy(4), Cute(1), perfect(1), pleased(1), impressed(1), Starstruck(1), Excited(1), Surprised(1), Trippin'(1), Nerding(1)* (*user had customized the emojis eyes with glasses).
 Cheerful/Happy	Happy(10), Funny(1).
 Relaxed/Calm	Happy(7), Satisfied(4), Flirt(1).

Was it clear to you how to select mood/emotion?

It seems that almost everyone considered it clear how to track mood, however, it was noted that some used extra time to find the emoji they wanted to track because they were unsure of the meaning of the "emoji with star eyes." One pointed out that not all of the emojis corresponded with the emotion text, which confirms the findings from the design exercise.

Was it clear to you how to select degree/intensity of a mood?

On iPhone the users answered that it was clear and easy to understand. On android, however, the answers were a bit divided. Two of the persons answered that this was clear. One of them added that the arrows could have been bigger. While the last person answered, no, not quite.

Are there other emotions that you would like to choose between?

Three of the five persons said that there were other emotions they would like to choose between such as tired, awake/energetic/powerful, and stressed.

Was it clear how to find previously tracked mood?

Almost everyone, four of the five persons reported that it was clear.

Was it clear how to delete previously tracked mood?

In this question, the answers were quite divided. One answered 'Yes', another 'yes, when you manage to find the day on the calendar it is easy', 'when he first found it it was simple', 'no the person wanted to click on the icon not the data as supposed to', and 'Medium'. This shows that the action of deleting was clear when they first found the emotions they had tracked that day, however, improvement has to be done to make it intuitive for the users to find the list of emotions.

Seeing the results from the user test, it gave some insights into improvements that are needed in the mood tracking interface. However, the data collected was a bit sparse. To explore more details of these issues, and get more in depth data, unstructured interviews were performed, using open ended questions.

Unstructured interviews After the students from Amalie Skram used the app at home for one day, were they got three notifications at 10, 15, and 21 o'clock, interviews were scheduled where they were asked about the use of the app. Six persons were interviewed; five students and their teacher(usability expert). The interviews were performed as open-ended interviews. The form used to guide the interviews can be seen in appendix F. Afterwards, the users were told to fill out the check list in appendix G, where only part 1 is relevant for this study.

The overall goal of performing the interviews was to explore more in-depth how the students perceived the mood tracking interface. Several sub-goals were created to explore this; find out whether or not the way of selecting mood and applying degree works, if any of the emotion alternatives needed change, and what the students thought of receiving notifications(if it was ok, and how often they consider it ok to be reminded).

Is the way of selecting emotion working?

All six interviewees managed to select emotion when trying to track mood. However, one person noted that s(he) was unsure in the beginning, since it was nothing written on them, and s(he) was a bit afraid that one would accidentally track a mood by clicking on one. But when (s)he clicked on one, s(he) figured it out.

Should the emojis expressions and colors be changed?

In the light of the participants responses, the expressions on the emojis should be changed for some of the emotions. One noted that the yellow(cheerful/happy) and the orange emoji(excited/lively), was pretty similar. Another pointed out that Sad should change place with the angry emoji, since the red one looked more angry, and was therefore perceived as more negative. This is in thread with the findings of Alismail and Zhang (2020). When they explored how participants perceive facial emoji Likert Scales in online surveys, they found that the participants first use descriptive words to decide whether it is positive or negative. Next, they use the order of the emojis to decide the level of emotion. This indicates that emojis are not interpreted as stand-alone, but on a scale. Further, it was mentioned that the emoji for the emotion relaxed was a bit different than expected. This confirms the results from the design exercise. In addition,

three of the interviewees reported that they would like to choose the emotions tired, stressed, and powerful/hyper. Regarding the colors of the emojis, one participant answered they were fine, whereas another suggested that the emotion happy should be green, and that the 'tense/nervous emoji in the middle should be yellow, since s(he) considered the color green to be more happy than negative.

Is the way of applying degree to a mood working?

When asked if they took the time to apply degree to the emotion, four of the six users responded yes, whereas one answered 'sometimes, it does not take that much extra time. Actually I felt it went pretty well for me', and the last one answered 'no I skipped that'. However, the person responding no, might not have used the app at all based on other answers given, and the fact that s(he) did not respond to any of the questions regarding the app in the tick off sheet. It could be that this is the person that did not join the user test. This is reflected in the user data, where there were only five persons tracking mood on the home test, not six.

The students where in addition asked which type of scale they would have preferred when applying degree to an emotion. Here some of them seemed quite unsure. When asked what their thoughts were to use a numerical scale instead, one answered 'it would have worked as well, it had been better with numbers, maybe more alternatives?' Another person stated that 'it would have worked as well, but was not sure what (s)he preferred.' A third person said 'it is fine as it is', while another person was quite ambivalent saying 'it is better with 1-2-3, preferably 1-10' at the same time as s(he) stated that it was good that the current solution had few alternatives. The person that might not have used the app responded: 'I don't know, I often choose the one in the middle anyways.' Whereas the last one; 'It is nicer with words than numbers, if one have math anxiety!'

Seeing the user log data, only one of the five persons that tracked their mood at home applied "A little" on all his/her mood trackings. However, it is not possible to know whether this is in fact because s(he) felt the degree was most suitable to his/her emotions, or whether s(he) did not apply the degree at all.

Positive and negative aspects about the app

When asked what they liked best with the app, a participant responded; 'that you could go and see the moods you had tracked', another stated; 'that it explain it self, it is intuitive, and easy to figure out, there is not so much happening, so that is fine'. Further, one participant expressed that s(he) liked that it has emojis, it was easy to understand and to know what to do, another that it was appealing, and easy to use. One of them did not mention anything. This could be because s(he) was in fact not pleased with the app. As we can see from the negative aspects s(he) reported; 'I would not use the app on a daily basis, the way of choosing was cumbersome, the picture in the background was annoying and disturbing because it did not fit with the other things. The elements in general were too small, the calendar was small, much of the screen space was not used.' This is most likely a technical issue with the responsibility to different screen sizes. In the tick off sheet, appendix G, the same person was the only one reporting that s(he) had not used the statistics to previously mood trackings.

The rest of the participants responses to what they liked the least with the app, was; 'It was a bit boring. It was hard to understand where to click, I had trouble finding statistics, I did not knew that it was a thing that you could click in the calendar.' Others seemed more unsure; 'Not sure, I did not notice that there was something that I absolutely did not like','I don't know really. in the start it was difficult to find where the moods were registered in the calendar.' The person that might not have used the app, but was shown the design in the interview said 'The round menu was a bit weird'. The last person responded 'I clicked wrong, I thought you registered the mood by clicking the big 'X', the one that closes the menu. I first got that when I went to the Statistics and saw that there were no tracked moods there.

Suggestions for improvements

The users suggested several improvements for the mood tracking interface. One was to have a tutorial in the start, with a short intro to the different functions, another suggested to maybe change to a more obvious calendar symbol, but noted that the heart worked well for his/her part. The opportunity to choose background photo was mentioned, where one student stated that they had discussed in class that it would be

great to be able to change it and to customize it themselves. When told that it was actually possible to change in the app, (s)he reported that (s)he had not looked for it. Some suggested other ideas for the mood tracking: to have a slider with the emotions, to have the menu as list instead, or the possibility to see a list of all the other emojis when you click on one. Another suggestion was to reduce the number of clicks one has to do to track mood by removing the confirmation bubble. Since the user anyways have the opportunity to delete the mood afterwards.

Feedback on receiving notifications?

As mentioned, one of the persons did not respond to the questions regarding the MoodTracking app. this was probably because s(he) had not used it. On the tick of sheet in appendix G, all five respondents answered yes on whether it was tempting to click on the notification message they received to track their mood. When asked whether they considered getting notifications three times a day to be too much, suitable, or too little, two answered too much, two suitable, whereas one answered too few.

Unexpected things

That one of the participants misinterpreted the 'X' to close the menu as a way of confirming the mood tracking was unexpected. A reason for this might be that the 'track' button is not dominant, while the X is very big in comparison. How the button is now, it looks pretty flat, and not so appealing to click on. This should somehow be changed to give the user a perceived accordance. In addition, it was unexpected that the responsibility was bad for one of the users. On other android phones and simulators, the calendar cannot be bigger. This is, however, an important finding that shows that the calendar does not scale well on android, leading to a bad experience for the user.

4.6.5 Evaluation and new requirements

Based on the feedback from the usability testing with users, new requirements were set to the mood tracking interface:

- Remove confirmation bubble.
- Swap colors of Happy/cheerful and Tense/Nervous.
- Change place between irritated/annoyed and sad/gloomy.
- Add the emotions: Tired, stressed, and powerful/hyper.
- Change the emojis Relaxed/calm, Excited/Lively, Tense/nervous, and Bored/Weary.
- Fix responsiveness issue of calendar on android.
- Make the mood degree arrows bigger on android.
- Make it easier to find previously tracked mood.
- Make track button more clear and how to shut down the mood overview menu.
- Small Tutorial in the start?
- Change statistics symbol to be a calendar.

The final version of the MoodTracking app is presented in Chapter 5.

4.7 Chapter Summary

This chapter described the development process of a high fidelity prototype of a mood tracking interface. From making initial sketches in the pre-phase, a low-fidelity prototype in iteration 1, a mid-fidelity prototype in iteration 2, to a high fidelity prototype in iteration 3. The design phase, test phase, and evaluation phase was described for each design iteration.

5 Mood Interface Features

This chapter presents the final version of the prototype. Some of the new requirements found in design iteration three were implemented.

5.1 Final Requirements and Use Case

The following requirements were implemented:

- Remove confirmation bubble.
- Swap colors of Happy/cheerful and Tense/Nervous.
- Change place between irritated/annoyed and sad/gloomy.
- Fix responsiveness issue of calendar on android.
- Make the mood degree arrows bigger on android.
- Change statistics symbol to be a calendar.

The requirements that remains for future work:

- Add the emotions: Tired, stressed, and powerful/hyper.
- Change the emojis Relaxed/calm, Excited/Lively, Tense/nervous, and Bored/Weary.
- Make track button more clear and how to shut down the mood overview menu.
- Make it easier to find previously tracked mood.
- Small Tutorial in the start?

Due to time constraint there was not possible to make all changes desired.

5.1.1 Final use case

The use case shows the process of how to track mood in the final high-fidelity prototype;

1. The user opens the app by clicking the app icon
2. The user clicks on the 'Track Mood' button.
3. The user clicks on the emoji corresponding to the emotion (s)he wants to track.
4. The user drags the slidebar (iPhone, figure 31), or clicks on the arrows (Android, figure 30), to find the desired degree/intensity (s)he wants to track.
5. The user gets feedback on the mood tracking
   (a) Feedback indicates to the user that the mood tracking was successfully completed.

5.2 Mood tracking

The mood tracking functionality offers the users the possibility to select an emotion by clicking on an emoji in the mood overview. When the user clicks on an emoji, the other emojis colors are given a lower opacity to make the selected emoji stand out from the rest. Each emoji has a caption shown in the middle of the circle that dynamically switches based on the current selected emoji. If none is selected, the message 'No mood selected' is displayed as seen in the first picture in figure 30.

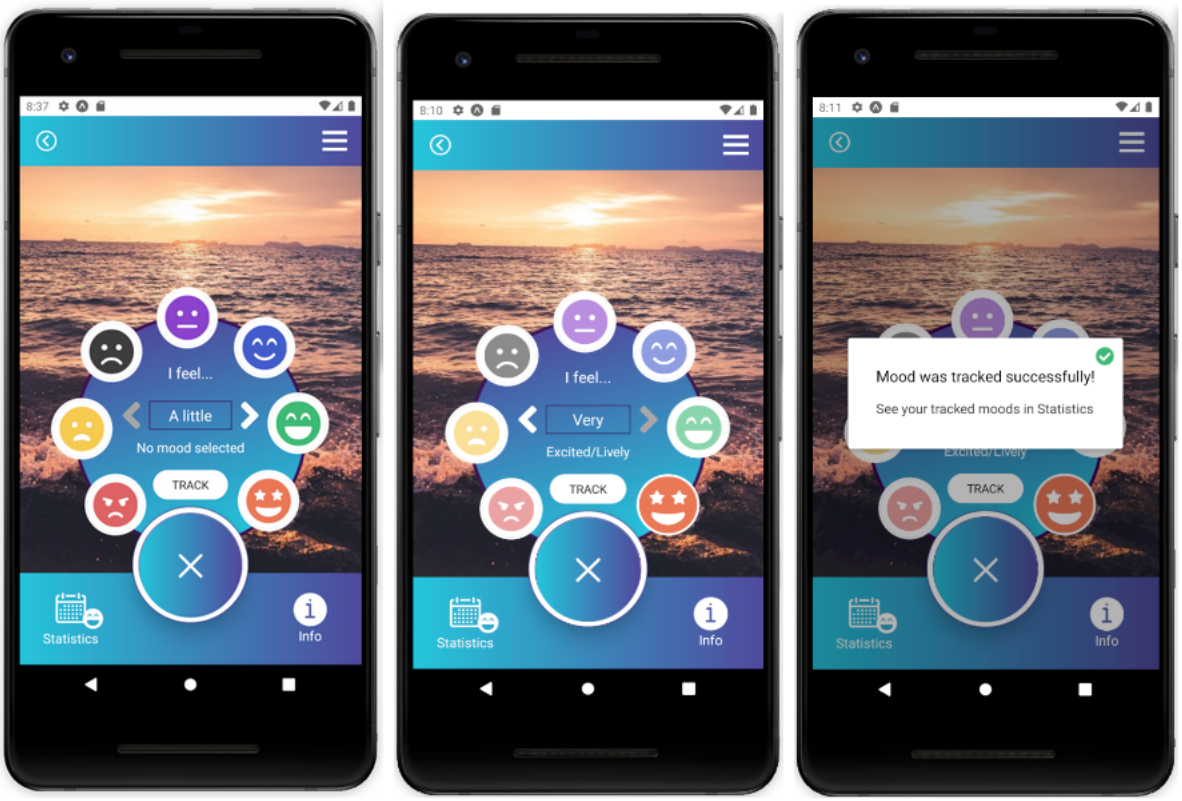


Figure 30: The process of tracking mood on Android

Next, the user may choose to apply the degree/intensity of the emotion. Three different degrees can be chosen; 'A little', 'Somewhat', or 'Very'. For instance, in figure 30, looking at the picture in the middle, the text inside the mood overview reads: *I feel...very Excited/Lively.* A feedback dialog is displayed when the user hits the 'TRACK' button shown in the right picture. The dialog states: *Mood was tracked successfully! See your tracked moods in Statistics.* Removing the confirmation bubble reduced the number of clicks needed to track mood. Further based on the new requirements from iteration three, the colors for Happy/Cheerful and Tense/nervous were swapped, and the irritated/annoyed changed place with sad/gloomy. In addition, the size of the arrows to apply degree on Android were significantly increased.

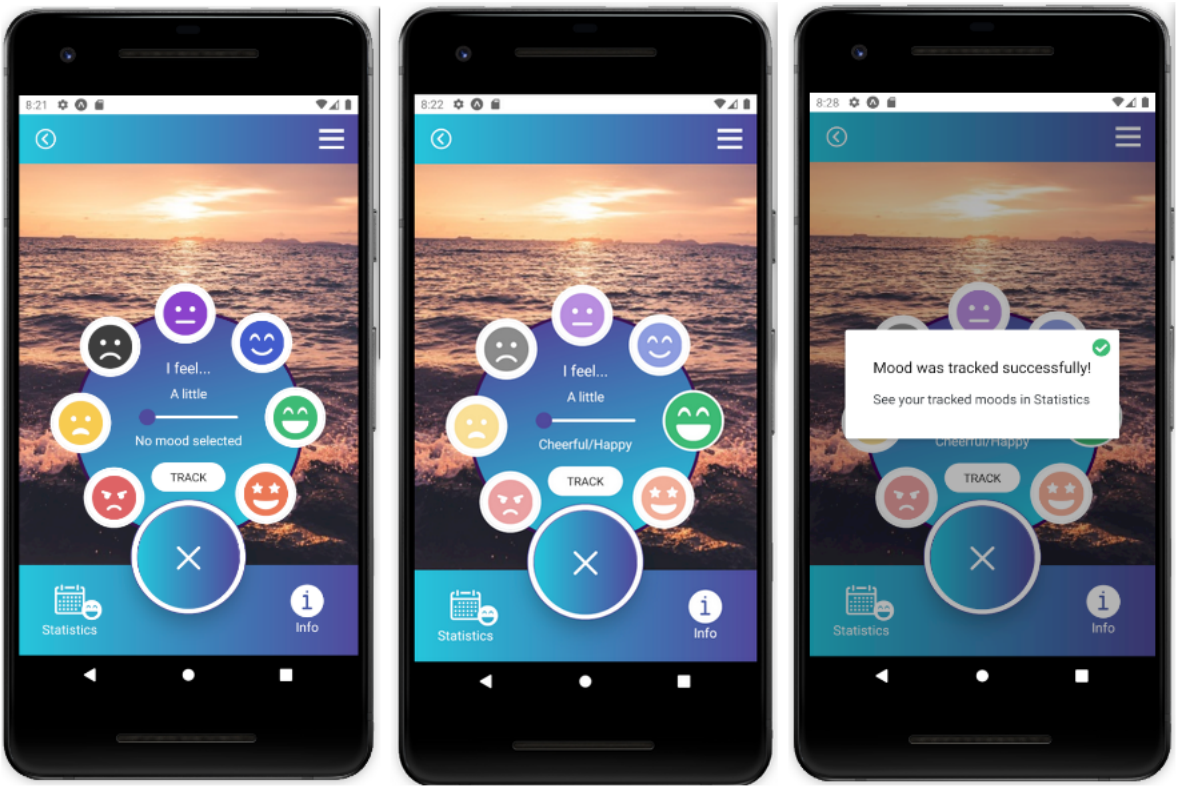


Figure 31: The process of tracking mood on iPhone

Changes that remain for future work is to make the track button more appealing, add the new emotions; tired/sleepy, stressed, and powerful/hyper, and change the emojis that were most misinterpreted by the users, namely; Relaxed/Calm, Excited/Lively, and Tense/nervous. As seen in the next section, the use case was updated with the new changes in the process of tracking mood.

5.3 Statistics

For the statistics functionality, the statistics icon was changed to a calendar with an emoji on it (see figure 32). This was done to give the user a cue that it contains mood data. Further, a solution to the responsiveness issue of the calendar was implemented, however, this needs to be tested on several android phones. To make it easier to find previously tracked mood in the calendar, it could be questioned whether a small tutorial is necessary. There should be ways to make this intuitive without having the need for a tutorial. The usability experts did not seem to have an issue with finding the

detailed view by clicking on a date in the calendar. However, this is probably because there were already mood trackings in the user accounts they tested. The dates marked with a dot, give the user a cue that there is something there to see, however, for the students, the user accounts they tested had no previously made mood trackings. This is something that should be dealt with in future work. Since the users did not seem to have any problem finding the statistics page, it might be better to just implement more cues in the design on the statistics page, to 'nudge' the user to find the detailed view, rather than implementing a tutorial for the whole app.

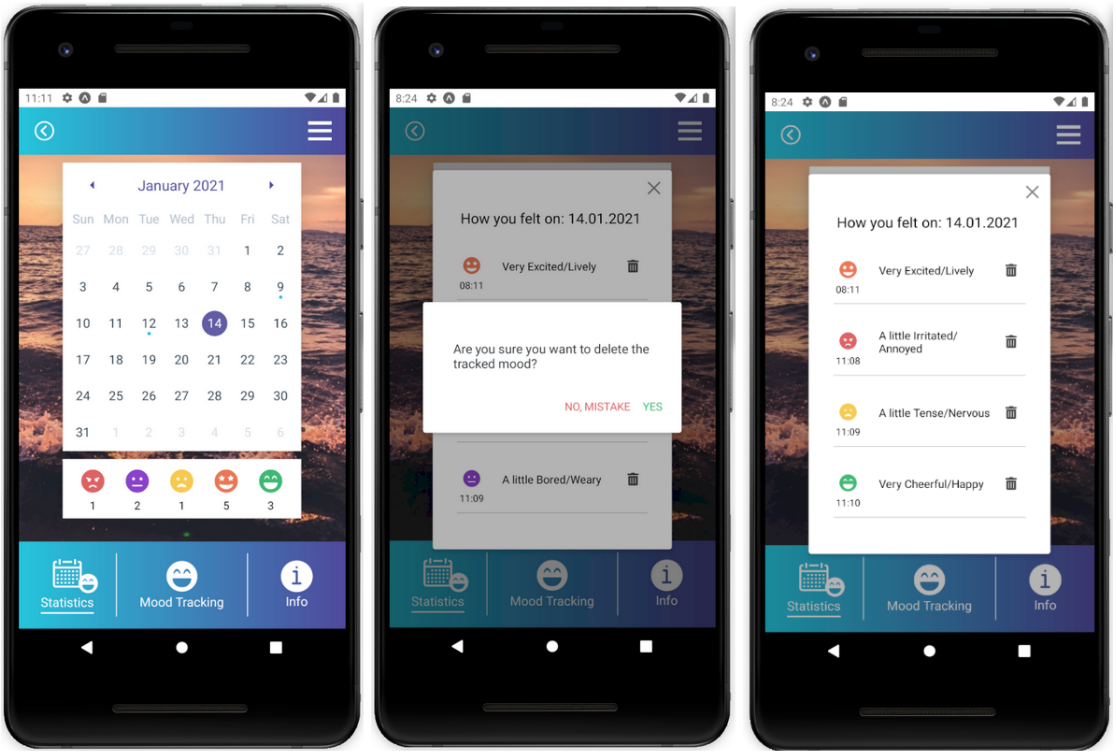


Figure 32: The statistics page of the mood tracking interface. The users may click on a date to get a detailed view of mood trackings for a day. The picture in the middle shows the dialog when the user is deleting a mood tracking item from the detailed view.

5.4 Conceptual design

The conceptual design made in the pre-phase was updated to fit the final prototype. As seen in figure 33, the current functionality in the mood tracking interface is marked with a yellow color, whereas features to implement in the future are marked green, such as the possibly to contact mental health professionals and share data with professionals.

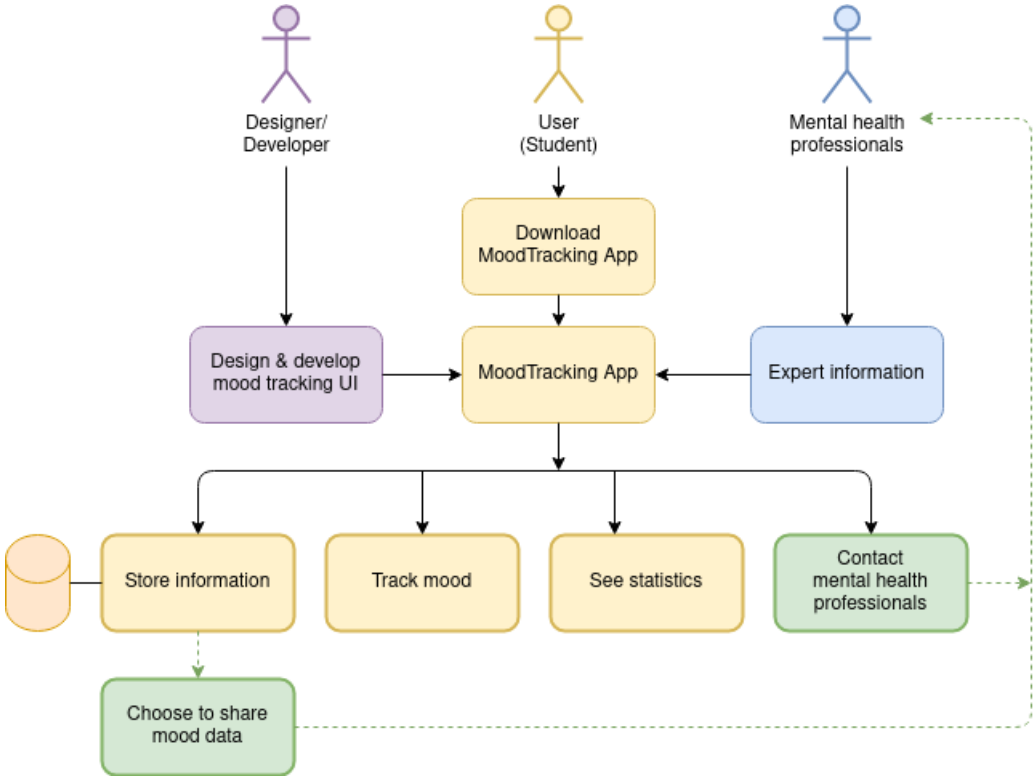


Figure 33: Showing the conceptual design after updating it with the changes made during the prototype development

5.5 Chapter Summary

This chapter described the features of the final high-fidelity prototype of a mood tracking interface for students. However, the prototype still has a lot of potential for improvement, so there are changes that remains for future work.

6 Survey of student attitudes to Mood Tracking

In this chapter the results of a survey of students asking about their attitudes towards the use of a mood tracking app and sharing of mental health data is presented. The goal of the survey was to explore *RQ3: What are students' attitudes towards sharing data about their mental health?* The survey was distributed through groups and channels in the social media platforms Facebook and Discord. The survey asked about their motivations for using a mood tracking app, which type of data they consider ok to register, and share in a mood tracking app, and which aspects were important for them to use a mood tracking app (see Appendix H).

The survey was first tested by performing a pilot study on a person who would not be participating in the actual survey. The test was done in order to discover flaws in the survey design, and see whether formulations of the questions and/or the answers needed to be changed.

6.1 Participants

A total of 26 students responded to the survey, where 10 were female and 16 were male. The respondents were students from different fields of study such as studies related to IT, media and iteration design, clinical psychology, business, Human resource management, and cognitive science. The number of respondents was considered to be too few to represent the students as the target population, however, it can give some interesting indications.

6.2 Results of the survey

Attitudes towards usage When asked if they would like to use a mood tracking app to monitor their mood, the answers were almost divided equally on the three alternatives, figure 34. Eight of the respondents answered that they would like to use it, whereas nine were unsure, and the remaining nine reported they would not like to use it. The students reported that they would like to use a mood tracking app, as a diary, to

keep track of moods, to notice mood patterns, to predict and be more conscious about own behaviour, to get a better understanding of why mood swings happen, to learn more about oneself, to see how the mood is affected by certain events, and to better routines. Further, on what they wish to accomplish by using a mood tracking app, they answered: to get an overview of their mental health trends, get a more stable and better mood, look for patterns, learn about oneself, learn how I treat myself and others, prevent mood swings from happening so often, to see if for instance walking outside at night versus daytime would influence my mood, get better insight in my own feelings, enjoy life more and waste less time, and to be positively surprised how often I am happy.

Figure 34: Students responses to the question: Would you like to use a mood tracking app to monitor your mood?

Motivation for use Eight of the students mentioned the desire for good and improved mental health and happiness as a motivation, and thus being able to track mood to get a better understanding of causes and effects, in order to avoid bad mood periods. One student answered that the motivation would be to get a more stable mood, and pointed out (as a girl), to stabilize it through the month. Another answered that it is important to learn about oneself, and that s(he) believe a mood tracking app could contribute to this in ways that books, the internet or a psychologist could not.

Six of the students, noted that if their mental health got bad enough, or if they struggled with their mood, this would be a motivation for using it. One of the students noted that s(he) used Daylio quite some time in the past, because s(he) wanted to stabilize his/her mood. However, after his/her mood improved s(he) stopped using it, and tracks mood in a bullet journal instead. Two students mentioned to see if there is indication of depression or mental health illnesses. One of them noted that if possible, the app should be able to tell if you are easy, moderate, or heavily depressed based on the information typed in, and recommend to talk, call, or do something.

There were three students who noted usability aspects as a motivation, where they stated that it had to be easy and fast to use, it should not take longer than a minute to register basic mood data, and you should see progress in a nice way. One noted that it is important to know that the information given to the app is safe. If the creators were able to create a safe app s(he) think the users would not mind sharing a lot of information if this enabled them to get a better mood tracking experience. Two students mentioned external motivational factors, such as getting desirable rewards for tracking mood, for instance coupons or discounts on certain products in stores.

Frequency of mood tracking When asked how often they thought they would track mood, the students answers where quite divided. One answered it depends how much time it will require, I wish I could manage to do it every day. Others responded thrice a day, daily, weekly, until I feel like I know myself good enough that I will not need it, it depends on how the app works, but I can see my self using it a lot, and as often as required to get intended results. One student said (s)he would track mood when s(he) remembers, and especially when there are bad moods. (S)he pointed out that it might be easy to forget when having a good or neutral mood. Another student said (s)he think s(he) would track extensively over a shorter time period to get more precise data, and that s(he) would not use it over a longer period.

Attitudes towards registering data Most students considered it ok to register mood statistics(23 students), notes regarding activities when having a certain mood(22 students), and notes regarding thoughts when having a certain mood(19 students), figure 35. Eleven of the students considered it ok to register contact info, 9 students considered it ok to register medical diagnosis and mental health history, whereas only 3 responded none of the data.

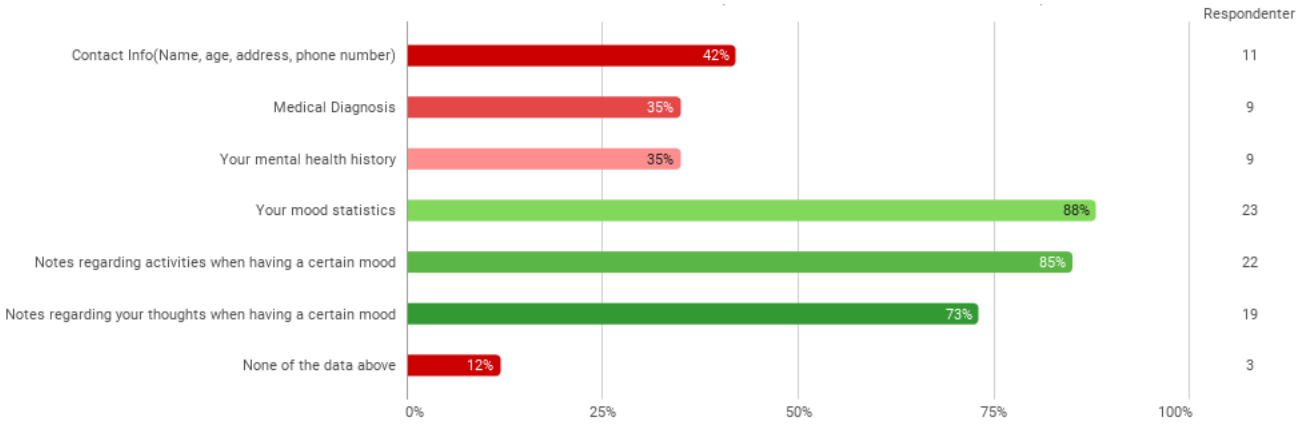


Figure 35: Students responses to the question: Which type of data would you consider ok to register in a mood tracking app?

The students reported that they would like to register specific news stories such as lock down(during pandemic), election results, tragedies etc. to see whether it impacted their mood, data surrounding other diagnosis, such as tracking ADHD behavior to see if a diagnosis is needed, sleep pattern, food and beverage consumption, drinking habits(alcohol), medication, heart rate, women's cycle, activity level, data about socializing, such as differences when meeting strangers versus friends, and behaviour around certain types of persons.

Attitudes towards sharing mental health data On their willingness towards sharing data, 15 of the respondents answered they would be willing to share the registered data with a professional/psychologist, whereas 9 persons answered not sure, and only 2 persons no. The students were in addition asked which types of data they would be willing to share. Here they could choose as many answers as they wanted. As seen in figure 36, 20 students reported they were willing to share mood statistics, followed by notes regarding activities when having a certain mood (18 students) or notes regarding their thoughts when having a certain mood (15 students). For the remaining alternatives, 9 students responded medical diagnosis, 9 students mental health history, whereas 6 answered contact info, and only 3 that they did not want to share any data.

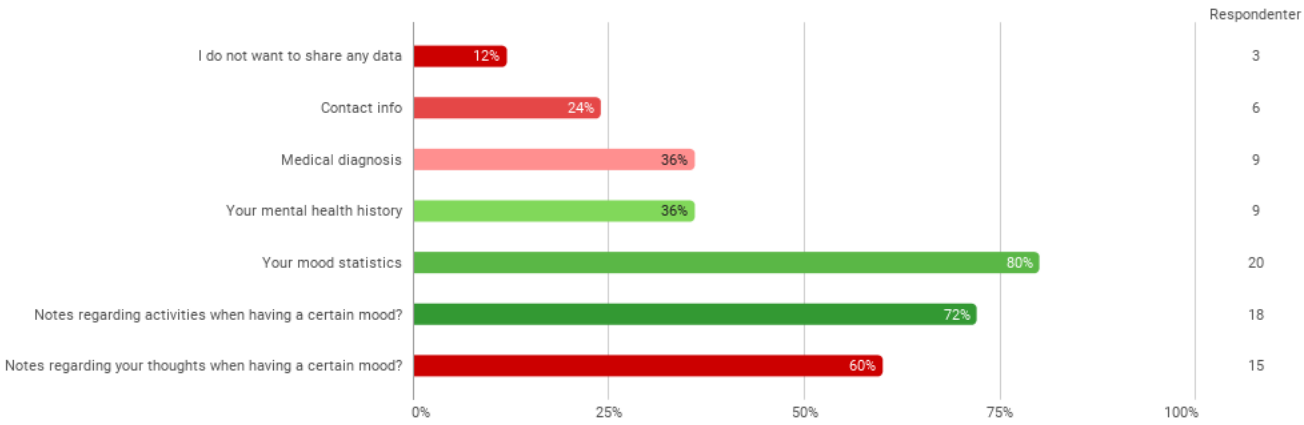


Figure 36: Students answers to the question: *Which type of data are you willing to share?*

Advantages and Disadvantages Two main themes emerged from the students responses to which advantages they could think of from using a mood tracking app; *'Recognition and Awareness'*(14 students) and *'Learning, reflection, and self regulation'*(9 students). Regarding the first theme, students mentioned that it could help them recognize stressful positions, take control over their own mental health, become more aware of what makes them happy, angry or sad, which activities or lack of activities that trigger their mood, and become aware of their own personality, and presence around others. The second theme is very intertwined with the former, because recognition and awareness will improve learning abilities by facilitating reflection, and thus self regulation. Here, the students responded to get a better understanding of mood, self regulation, mental training on how to keep a more positive state of mind, and balancing moods.

Other more general advantages mentioned, was to get better mood(1 student), and that there exists evidence where habit, health, and sleep tracking have gotten good results at all ages(1 student). In addition, one student mentioned that it could be easier and cheaper than going to a psychologist for a minor mental inconvenience. Another pointed out that it is good to track with a tool that is meant for behaviour tracking. Trying to use a note app could be less motivating, and become chaotic.

For the disadvantages, security and privacy was the most mentioned(11 students). The students expressed concerns of hacking that could lead to data leakage where sensitive

information could end up in the wrong persons hands, potentially resulting in severe damage for the users. Other problems that were mentioned was that it could be tedious and time consuming to use(6 students), that bad statistics can result in people being even more depressed(5 students), that some might get addicted to using the app(2 students), and thus not being able to regulate their own emotions without it, and lastly, that incorrect use might lead to incorrect results(1 student).

Important aspects for usage When asked which aspects they considered important for them to use a mood tracking app, 24 of the 26 respondents answered security, and 23 answered being able to see mood statistics, figure 37. For the remaining alternatives 16 answered the possibility to register notes, 14 aesthetically pleasing design, and only 9 the possibility to contact professionals. The students where in addition asked which aspect they considered most important, where 13 students answered security/privacy, 12 answered mood statistics, whereas 3 answered user friendly app and design, and 2 the possibility to make notes.

In the end of the survey, the students were asked whether there was other aspects that were important for them that was not mentioned. The aspects that were reported were to add events(meetings, funerals, weddings etc), the app could warn of potential stressful meetings and how to counter them, medication logging, a SOS-button that directs you to a mental health care number where you could get advise on how to cope with certain moods, ability to download information and easily delete the account, ability to make a custom tracking, and get motivational quotes, and daily motivations as memes, videos or stories.

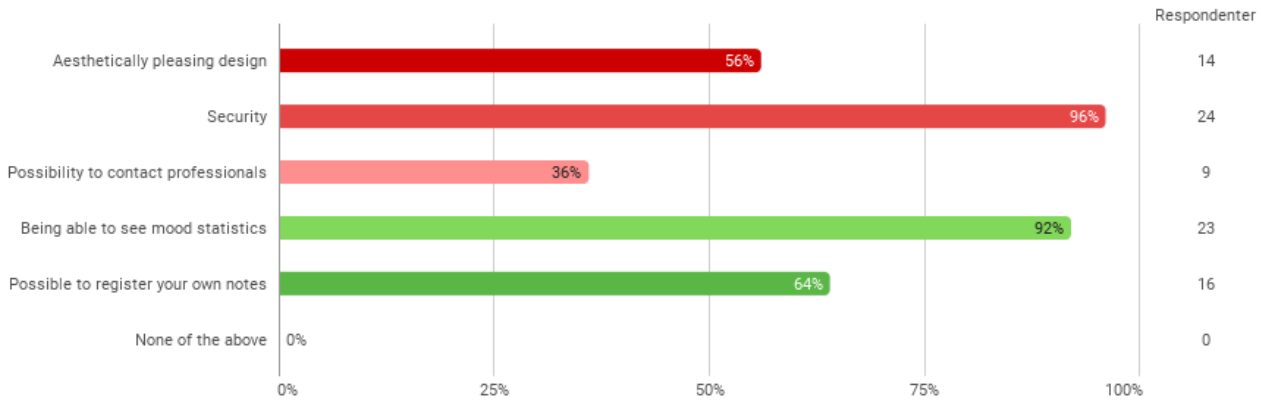


Figure 37: Students responses to the question: *Which aspects do you consider important for you to use a mood tracking app?*

The survey results showed that students are more willing to register and share mood statistics and notes regarding their mood, whereas they are less willing to share their contact info, medical diagnosis, and mental health history. Thus, it does not come as a surprise that security was mentioned by most as an important aspect for them to use a mood tracking app.

6.3 Chapter Summary

This chapter described a student survey that was carried out in order to explore student attitudes towards usage of mood tracking apps, and attitudes towards registering, and sharing mental health data.

7 Discussion

This master thesis work aimed to respond to the following research questions;

RQ1: What does the state-of-the-art say about using a mobile application to help assess well being in students?

RQ2: How do students perceive the mood tracking interface?

RQ3: What are students' attitudes towards sharing data about their mental health?

RQ4: What should designers of a mobile mood tracking interface consider, in order to best support an intuitive design to motivate students to track their mood?

The purpose of the research was to investigate how to best design an mood interface for a mood tracking app. The goal was to make it motivating for students to use. First a literature review was performed to answer RQ1. Next, a high fidelity prototype was developed. The evaluations during the prototype development; feedback from mental health experts, heuristic evaluation, and user testing, and a survey, were conducted in order to explore RQ2, RQ3 and RQ4.

7.1 Findings in literature

RQ1: What does the state-of-the-art say about using a mobile application to help assess well being in students?

The literature review showed that mood tracking apps that provide self-report could be a good tool to support persons with mental health problems. Mood tracking apps are commonly used to log mood, add explanations to mood, facilitate reflection, and share data. What motivates the user for using a mood tracking app is to: find mood patterns, learn about influencing factors, monitor symptoms, and make changes to improve mood.

Several challenges were encountered in the review. Product/application descriptions often lack evaluation in the context they are going to be used, and few research studies

have focused on usability, resulting in researchers having designed tools they think the users want without consulting them. The lack of focus on usability in this area could be why many study's have shown to have low engagement. The existing technologies are mainly informational, so there is a need for an easier and improved design to make mood tracking more engaging. To change behavior over time, human support is often required, and there exists a misconception that technology is a new way of delivering psychotherapy, which has resulted in rigid thinking when it comes to design. The review revealed that the users trusting the application will be essential for whether they will use it, and users desire to personalize input. Thus, one can conclude that a mood tracking interface that is designed in from a user centric perspective is a good idea.

7.2 Findings in prototype development

The design process consisted of a pre-phase, and three design iterations. Feedback from mental health experts during the pre-phase and the 1st design iteration showed that symbols and words for the interface design should be chosen with care. Symbols such as the bar chart icon and the word "carefree" were examples that the psychologist pointed out as negative. In the heuristic evaluation in the 2nd design iteration, the usability experts discovered many important usability problems that needed to be improved. The number of the issues encountered, indicates that the test with mental health experts in the previous design iteration should have been performed on a mobile phone, and not on a big screen. This would probably have discovered some of the issues earlier. Even though this was early in the design process, paper versions of the app could have been made to simulate the interface. The feedback from usability experts clearly showed that there is a need for users to see an overview of all emotions to select between, and that negative and positive emotions should be grouped together to make it easier for the user to find the emotion they relate to.

The findings from the design exercise, user test, and interviews in the 3rd design iteration, showed that the way of tracking mood worked fine, however, the students did perceive emojis and colors differently. A solution to address this issue could be to provide a set of predefined emotion labels, where the users can choose an emoji, and

customize the color of it to make the representation of the emotion best fit their own perception. This should further be explored with consulting psychologists. On one hand, it is important that the users are able to relate to the emotions/feelings they are going to track. If not, it will be cumbersome to use the mood tracking tool, which likely will result in the user not using the product. As noted in the usability test results, some users reported that they used extra time to find the emoji they would like to track, because they did not feel it corresponded to the text label. On the other hand, it is important to consider that it should be possible for a psychologist or other health care personnel to make sense of the data, in case the user wants to consult professionals while they use the mood tracking app.

The users expressed that it was difficult to find previously tracked mood. Here the suggestion of making a simple tutorial when the user starts the app for the first time, or implementing cues on the statistics page could be useful. The feedback bubble shown after completing the mood tracking, clearly states that it is possible to see previously tracked moods in Statistics, however, when there are no tracked moods the previously days in the calendar, it is not visually shown to the user that the dates get marked with a dot if there are mood trackings. This clearly leads to confusion, and the user is left without knowing that it is possible to see a more detailed view of the moods.

In addition, users seemed to enjoy different layouts. While some users expressed the desire to be able to change background, another user noted that it was distracting with a background picture when tracking mood. This confirms the need for customization. A possibility to address this issue, could be to implement a design solution where users can customize layout in regards to complexity and simplicity. While some prefer to personalize the app themselves with beautiful pictures etc, others might desire the app to be as simple as possible, with the bare minimum of what is needed to track mood. The feedback regarding the notifications show a need for customization as well. All participants reported that the notifications were appealing to click on, however, their opinions regarding how often they consider it suitable to receive notifications were quite divided. Thus, notification settings for the users to choose frequency should be implemented. The results from the survey confirms this, where the students answers were divided towards how often they thought they would track mood.

7.3 Findings in survey

The survey showed that the desire to have a good mental health was the main motivation to use a mood tracking app, and thus struggling with mental health issues, or wanting to see whether there is an indication for a diagnosis was a motivational factor. This could potentially be the reason why only almost a third(8 out of 26) of the students reported they would use a mood tracking app. Persons that do not feel they have any problem to address, might not see the point, nor have the need to use one.

The students reported the advantages of using a mood tracking app to be recognition and awareness around their own mental health, to facilitate learning and reflection in order to get a better understanding of their mood, and thus being able to regulate it. This is in thread with the findings in the literature review. Regarding the disadvantages, security and privacy was clearly the biggest concern among the students, and it was mentioned by most as an important aspect for using a mood tracking app. To address security and privacy issues, the mood tracking app could for instance implement a bio-metric id such as fingerprint touch-id, or face-id for opening the app. BankID could be implemented, however, it is important to consider that logging in have to be simple. One should avoid that the process becomes cumbersome. Further, the mood tracking data could be stored on the users phone, and not in a common database. It should be easy for the user to delete all their data as well.

In addition, it was mentioned that it can be time consuming, and that bad statistics can lead to even worse mood. How to best present statistics, and how to avoid the users from being further depressed by seeing their results is something that should be considered in future work. The fact that mood tracking can be time consuming could be another reason why some of the students said they would not use a mood tracking app over a long time period. It requires some data input to understand mood changes. This could be an indication that a mood tracking app should be used as a tool over a shorter time period. If one starts to struggle again, a new period of tracking mood could be useful to see if there are new factors influencing the mental health.

Further, the survey showed that students considered it more ok to register statistics and own notes, than to register contact info, medical diagnosis and mental health history.

The same result was seen regarding sharing data, where the results gave an indication that students are less willing to share data that is considered more sensitive such as contact info, medical diagnosis and mental health history. This does not come as a surprise since the students biggest concerns where security and privacy. However, the data collection from the survey is sparse, thus further research is needed to see whether these findings could apply to the whole student target population.

7.4 Answers to research questions

The findings from the literature review, the prototype development, and the survey made it possible to answer the research questions.

RQ1: What does the state-of-the-art say about using a mobile application to help assess well being in students? The literature review showed that using a mobile application that provide self-report could be a helpful and good tool to assess well being in students. However, current mood tracking apps have challenges of low engagement with the users.

RQ2: How do students perceive the mood tracking interface? The findings from the prototype development showed that the way of tracking mood worked well for the students, however, how they perceived the interface varied. The students interpreted both colors and emojis chosen for the emotions in different ways, they seemed to enjoy different layouts in regards to simplicity/complexity, and their preference for how many times to receive notifications varied.

RQ3: What are students' attitudes towards sharing data about their mental health? The survey result suggests that there is an indication that students are positive towards sharing data such as mood statistics, and notes regarding activities and thoughts when having a certain mood. However, they are concerned with security and privacy, and thus are less willing to share sensitive data such as contact info, medical diagnosis, and mental health history.

RQ4: What should designers of a mobile mood tracking interface consider, in order to best support an intuitive design to motivate students to track their mood? Designers should consider the following set of recommendations when designing a mobile mood tracking interface for students:

- Avoid using words or icons that can give the users a negative feeling.
- Provide an overview of all moods that students can choose between.
- Group positive emotions together, and negative emotions.
- Provide the possibility to choose the color applied to an emotion.
- Provide the possibility to choose or customize the emoji applied to an emotion.
- Provide a predefined set of emotion captions for professionals to be sure of what the user tracks.
- Reduce the amount of clicks needed to track mood to a minimum.
- Provide statistics
- Provide the possibility to contact professionals/human support.
- Make it possible to personalize the app, for instance background photo, colors on layout etc.
- Provide different layouts for the students to choose between (e.g. one simple/ one more complex).
- Implement notifications to remind the users to log mood.
- Implement notification settings where the users can adjust the notification frequency to fit their need.
- Implement security measures (e.g. a bio-metric id to access the app).
- Make it easy for users to delete their data.
- Consider implementing interventions in the app, such as advise to the users on how to feel better.
- Consider implementing functionality to add notes, log sleep pattern, medication, activity, events, and motivational quotes, memes, videos, or stories.

7.5 Limitations

As to every study there exists limitations, here time constraint being one of the most important. The fact that I served the role as both a designer and developer resulted in trade-offs in the design, and it made the time schedule even tighter. Evaluations in the prototype development had its limitations as well. Ideally, all the evaluations should have been in person, however, for the heuristic evaluation one of the experts did not have the opportunity to meet in person. In addition, the heuristic evaluations showed that the design process would have benefited from testing on mobile phone earlier. Regarding the usability testing with students, a lot more data could have been collected if it would have been possible to be at the school with the students to observe them. Unfortunately, pandemic restrictions of Covid-19 made this impossible. For the survey results it might have been different if the students had used the mood tracking interface before being asked their opinions (i.e., they gave opinions without having actually tracked their mood - well one had done so before).

All the data gathered in this thesis work is qualitative data, which shows indications, however more research will be needed to see whether these indications are conclusive.

7.6 Chapter Summary

This chapter discussed the findings from the literature review, the prototype development, and the survey, and answered the research questions, before stating the limitations of this thesis work.

8 Conclusion

The state-of-the-art was investigated by reviewing articles, documents and products related to the research problem. The review of literature revealed that one of the main problems with mood tracking apps for mental health is that they often lack focus on usability and testing with users. This was discovered as a problem area where this research work could extend the state of the art by consulting users about their goals and thoughts, to explore how they perceive the mood tracking interface, what their needs and concerns are, and what motivates them. Further, the methodology of the research has been defined by choosing which methods and data gathering techniques to use, where research through design formed the basis of this research. The insight gained from the theory and methods was used to define initial requirements to guide the interface development. An iterative user-centered design process was used to develop a prototype of a mood tracking interface.

The prototype development process had several design iterations, where the interface was evaluated by mental health experts, heuristically by usability experts, and through user testing: design exercise, usability testing, and interviews with students. Lastly, a student survey was performed to explore their attitudes towards usage of mood tracking apps, and sharing mental health data. The main findings from the prototype showed that the way of tracking mood worked fine, however, the students interpreted colors and emojis differently. In addition, they seemed to enjoy different layouts and had different preferences of how many times to receive notifications. This indicates that users should be able to personalize layout in regards to simplicity/complexity, and customize their own colors and emojis on a predefined set of emotion labels. In addition, notification settings should be implemented. The survey result suggests that students are positive towards sharing data such as mood statistics and their own notes, however, they are concerned with security and privacy measures, and thus are less willing to share sensitive data such as contact info, medical diagnosis, and mental health history. However, more research is needed.

8.1 Research contribution

This thesis contributes to the research field by providing a set of recommendations of what to consider when designing a mobile mood tracking interface for students. In addition, it has produced an artifact that is available in an open source project, and it contributes with a preliminary analysis of the main functionalities in 24 different mental health apps (recall table 3 in Chapter 2).

Process The research design chapter has provided argumentation of the selection of methodology and methods used in the research process. RtD was chosen because it acknowledges a prototype as a source of knowledge, and that an artifact can be a research contribution in itself, which allows for designers to have an exploratory approach to research. A user-centered design process with a focus on usability and user experience was considered to be a suitable choice because cooperation with the user group was crucial to respond to the research questions.

Invention To assure invention, a literature review was made to investigate the state-of-the-art. The current state of students mental health revealed that many struggle, but few seek help with their problems. Further, the current state of mental health apps, showed that mobile apps that provide self-report can be a good tool to assess well being, however, mood tracking apps have shown to lack focus on usability, and struggle with low engagement. This research addressed these challenges by producing the mood tracking interface through a user-centered approach with a main focus on usability and users needs.

Relevance This research aim was to improve the current state of students mental health by contributing towards a mobile mood tracking app that can facilitate awareness and reflection of moods, so users can better understand the influencing factors, and thus be able to change these to improve their mental health. The research contributes towards this, however, it has focused on the action of tracking mood, more research is needed to investigate how to best visualize mood statistics in order to facilitate reflection.

Extensibillity This research design process has been well documented through thoroughly descriptions of the design, testing, and evaluation for each design iteration. This makes it possible for other researchers to derive knowledge, leverage from the work, and thus extend it. In addition, it has produced an artifact that is available in an open source project, which makes it possible for other researchers to further build upon the current interface design.

8.2 Future work

This contribution gives several possibilities for further research. First of all, the findings in the interface development should be tested with real users. This work has targeted students, and not specifically students who struggles with psychological issues. It is common to not target persons that struggles in early development, because you do not want to bother them at a stage when there are technical issues and usability errors. In addition, a longitudinal study could be performed to better explore their motivation for use over time.

Mental health experts could be consulted to see if a customiziable version of the mood tracking interface could be good for the users, and give valuable feedback to mental health professionals at the same time. One option could be to make a version of the interface where students could upload their own pictures that they associate with the emotions, in order to investigate which type of input the students easiest relates to. In addition, future work could implement one simple layout and one more complex.

Another area to look into is the accessibility of the design, such as making it possible to choose a color scheme customized for colorblindness, or the possibility to have text to speech, and speech to text functionality for visually impaired or blind persons.

Future research could investigate how Machine Learning and sentiment analysis could for instance be used on notes to see whether it is positive or negative. Potentially with advances in technology, a mood tracking app could predict whether a user is going to be depressed based on previously notes attached to certain emotions and activities, and which events they have plotted in their calendar. As suggested by a student in the

survey, the app could alert the user of a potential stressful event, and provide intervention or tips on how to cope with this.

By investigating all of the mentioned above, researchers can see if the current findings are confirmed, and contribute with new findings that extend the set of recommendations of what to consider when designing a mobile mood tracking interface for students. Lastly, researchers could investigate whether the current findings could be transferable to other user groups.

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Appendix A - Heuristic Evaluation Form

Heuristic Evaluation

Briefing:

This form is meant to test the usability and user experience of a mid-fidelity prototype of a mood tracking app for students. The purpose of the app is to provide students the opportunity to monitor their mood. In this version of the app, the students are supposed to be able to track their mood, see previously tracked mood, and delete moods they have tracked. In addition, they have the opportunity to contact professionals and customize the background photo of the app.

First, the usability experts will be given a link to the application with username and password to log in. Since the app is web based, the participants should log in on a browser on their mobile phone to get a more realistic feeling of how the app will be used.

Each usability expert should go through the design two times, and evaluate it independently. Below a set of tasks and questions are presented, that experts should respond to. Try to look at the app from the perspective of a student interested in tracking their mood.

After the evaluation, the usability experts will go through the priority of the different problems.

Tasks and Questions:

- Track the mood gloomy/sad with the degree/intensity 3.
- Track the mood Tense/Nervous with the degree/intensity 5.
    - Is it clear to the user how to select mood?
    - Is it clear to the user how to select the degree/intensity of a mood?
    - Does the mood tracking app inform students about what's going on, through appropriate feedback, when tracking their mood?
    - Is there a high risk that the user will apply the wrong degree/intensity of a mood?
    - Is it possible for the user to go back if (s)he accidentally tracked the wrong mood?
      Could click cancel and then do it again, but not really go back.
    - Is it clear to the users what the statistics icon and contact icon does?
- Find the moods you have tracked.

- Is it clear to the user how to see previously tracked mood for a specific day?
- Is it clear to the user how to see previously tracked mood for a specific month?
- Is it clear to the user how to delete previously tracked mood?

- Change background photo in the app
- Is it clear to the user how to change the background photo in the app?

In general...

- How did the app make you feel?
- Does the mood tracking app use words and terms that are familiar to students?
- If you would change anything in the app, what would change?
- Which changes do you consider most important to prioritize?

Appendix B - Design exercise

Øvelse 2 - Tolkning av emojis

2a) Brainstorming -For hver av de 7 ikonene, skriv ned alle ord du kommer på som forbinder deg med emojien.

2b) Marker det ordet som du synes beskriver emojien best ved å tegne en sirkel rundt ordet.

Appendix C - Consent, user test and interview

Samtykkeskjema for deltagelse i forskningsprosjekt moodTrack:

Formålet med prosjektet er å utforske forskjellige teknikker for å innhente informasjon fra brukerne på en enkel og effektiv måte. Vi ønsker nå å utprøve to applikasjoner:

1. **A mood tracking interface for mobile application -to help assess well being in students.**
   Dette er en masteroppgave ved Universitetet i Bergen (UiB) knyttet til institutt for informasjons- og medievitenskap og Centre for the Science of Learning & Technology (SLATE). Arbeidet er en del av et samarbeid med Høgskolen på Vestlandet (HVL). Formålet er å få innsikt i hvordan en best mulig kan designe en mental helse app for studenter.
2. **Persuasive design to increase adherence in Internet Delivered Psychological Treatment**
   Dette er del av et phd forskning ved Universitetet i Bergen (UiB) knyttet til institutt for informasjons- og medievitenskap og Centre for the Science of Learning & Technology (SLATE). Formålet er å utforske forskjellige teknikker for å innhente informasjon fra brukerne på en enkel og effektiv måte, slik at disse teknikkene kan bli anvendt for å hjelpe folk som har en vanskelig hverdag f.eks pga stress eller psykiske problemer.

Hva innebærer deltakelse i studien?

1. Utføre noen oppgaver som bidrar til bedre design av appene
2. Bruke appen(e) noen få dager, deltakerene blir bedt om å tracke humøret sitt 3 ganger i løpet av en dag. Testen er kun for å teste brukervennlighet av appen, svarene på spørsmålene vil ikke bli vurdert. Det er heller ikke en test av dine teknologiske ferdigheter, eller vurdering av din psykiske helse.
3. I etterkant vil deltakerene samles for et fokusgruppeintervju, hvor de vil få spørsmål om hvordan de opplevde bruk av appen(e).

Hva skjer med informasjonen om deg?

Informasjon som oppgis vil bli anonymisert, slik at deltakere i prosjektet ikke vil kunne gjenkjennes. Dataen som blir lagret vil bli slettet ved prosjektslutt, senest 1. januar 2022. Retten vår til å behandle disse dataene er basert på ditt samtykke. Det er frivillig å delta i studien og du kan trekke ditt samtykke når som helst.
Dersom du har spørsmål om studien, ta kontakt med:

Masterstudent **Astrid Hamre-Os**, e-mail: Astrid.Hamre@student.uib.no / tlf: 414 23 488
Phd stipendiat **Rosaline Barendregt**, email: rosaline.barendregt@uib.no / tlf: 969 68 567
Veileder Professor **Barbara Wasson**, e-mail: barbara.wasson@uib.no / tlf: 911 41 297

Samtykkeerklæring

Jeg har mottatt og forstått informasjonen om studien, og samtykker til å:

- ☐ delta i brukertestene.
- ☐ delta i fokusgruppeintervju.
- ☐ at informasjonen jeg oppgir blir behandlet frem til prosjektslutt.
- ☐ at informasjonen jeg oppgir blir anonymisert og publisert.

_____ _____ / _____ / _____
Signert av prosjektdeltaker Dato

SLATE Centre for the Science of Learning & Technology

UNIVERSITAS BERGENSIS

Appendix D - Instructions, how to install the apps

Fremgangsmåte for å laste ned appen(e) på telefonen

MoodTrack **Mood Tracking**

Vi har to apper: 1. MoodTrack og 2. Mood Tracking. Appen MoodTrack (1) er bare tilgjengelig på android telefoner. Hvis du har en android telefon, gjerne installer begge appene, du hjelper oss enormt :)

Mood Tracking til iPhone

Iphone brukerne: (1 app)

1. Klikk på denne linken eller scan QR-koden: Mood Tracking

MoodTrack til Android

Android brukerne: (2 apper)

- Klikk på linken eller scan QR-koden:
  - App 1: MoodTrack
  - App 2: Mood Tracking
- Følg instruksjonene på skjermen
  eller: Trykk på den hvite pilen øverst til høyre.
- Klikk 'Download' i dialogboksen som kommer opp etterfulgt av 'Open', og 'Install'.
- **NB: du må tillate mobilen å godta appen.** Dette er en ekstra sikkerhet for at brukeren skal være kritisk til kilder som ikke er publisert enda.
  I dette tilfellet er det greit å akseptere fordi vi vet at linken ikke inneholder noe som kan skade telefonen.

Mood Tracking til Android

Appendix E - User test

Brukertest Gruppe A

Gå sammen to og to. En av dere skal utføre brukertesten på den andre.

Blir testen utført på en IPhone eller Android mobiltelefon? (Sett ring rundt):
IPhone Android

- Det så ut som du synes gjesteforelesningen var veldig kjedelig.
  - Kan du prøve å track det i appen?

- Du er utslitt fordi du har hatt altfor mye å gjøre. Du synes det er vanskelig å balansere tid til skole, fritidsaktiviteter, og ha nok tid til å være sosial med venner.
  - Track hvordan dette får deg til å føle deg.

- Du synes det var sykt kult å oppleve yndlingsbandet ditt spille live i fjor sommer.
  - Track hvordan dette fikk deg til å føle deg.

- På grunn av korona pandemien har du ikke fått sett vennene dine like ofte som før.
  - Track hvordan dette får deg til å føle deg.

Spm: Var det tydelig for deg hvordan du skulle velge humør/følelse?

Spm: Var det tydelig for deg hvordan du skulle velge intensitet/grad av humør?

Spm: Er det andre følelser som du savner å kunne velge mellom?

- Finn det det humøret du har tracket i dag.

Spm: Var det tydelig for deg hvordan du skulle finne humør du har tracket tidligere?

- Slett det siste humøret du har tracket.

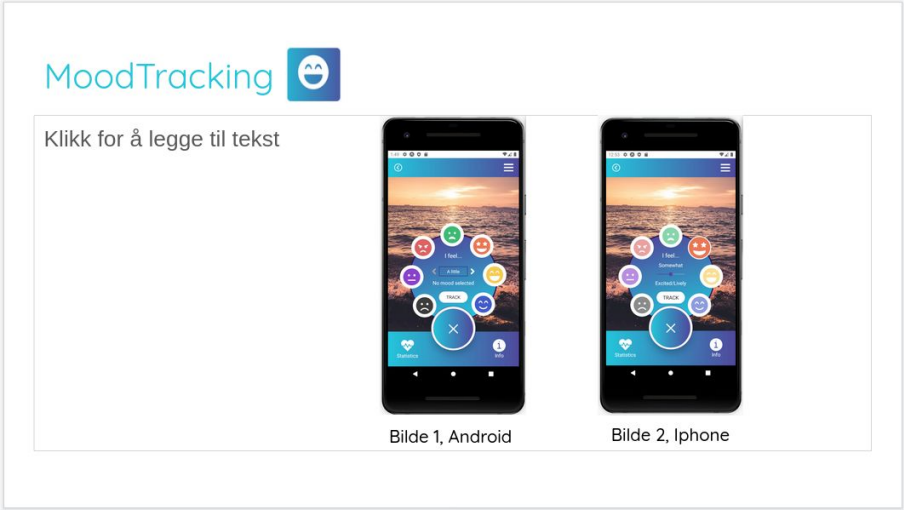
Spm: Var det tydelig for deg hvordan du skulle slette?

Appendix F - Open ended interviews, guiding form

Intervjuspørsmål

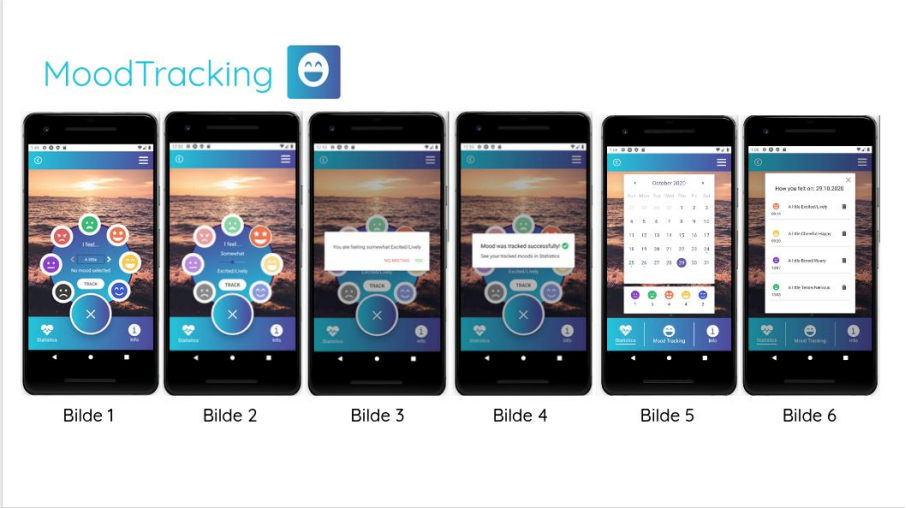
Overordnet mål: Utforske mer i dybden hvordan elevene oppfattet mood tracking grensesnittet.

Delmål: Finne ut om måten å velge humør og angi grad på fungerer. Om alternativene å velge mellom må endres. Om de synes det var greit å motta notifications, og hvor ofte de isåfall synes det er greit. Oppdage tekniske problem i appen.



Har du Iphone eller Android?

- **Når du skulle velge humør...**
  - Klarte du å finne det humøret du ønsket å tracke?
  - Hvordan var det å finne frem?
  - Hvordan var det å skulle finne ut hva du selv følte?
  - Var det følelser du ville valgt som du ikke fant i appen? Hvilke?
- **Tok du deg tid til å velge grad også?**
  - Hva synes du om å kunne angi grad av følelse?
  - Hva slags type skala ville du helst hatt for å angi grad av følelse, kategorier, nummer, andre ting?
  - I appen hadde du mulighet til å velge mellom tre ulike grader, little, somewhat og very. Skulle du ønske du hadde færre eller flere grader å velge mellom?



Mer generelle spm:

- Hva likte du best med appen?
- Hva likte du minst med appen?
- Tror du at du ville brukt en slik app?
  Hvis nei;
  - hva burde endres for at du skulle ville bruke appen?
- Har du forslag til endringer i appen?

Appendix G - Tick-off scheme

#

DEL 1

Gikk du inn i Statistics for å se humøret du hadde tracket?	Ja □	Nei □
Var det fristende å klikke på notifikationene du fikk om å tracke humør?	Ja □	Nei □
Hva synes du om å få notification 3 ganger om dagen?	For lite □ / Passe □ For mye □	

DEL 2

For de som har android

Hvis du hadde vært i en situasjon hvor det er viktig å tracke humøret ditt...		
Hvilken app var enklest å bruke?	□	□
Hvilken app ville du helst brukt?	□	□
Hvilken app tror du du hadde klart å bruke over lengst tid?	□	□
Hvilken app ga deg best følelse?	□	□
Hvilken app lot deg tracke humøret mest nøyaktig?	□	□
I hvilken app var det enklest å tracke humøret?	□	□

Og, i hvilke grad skulle du syns om den appen	
1. Appen kunne bli en del av min daglige rutine helt uenig / uenig / nøytral / enig / helt enig	
2. Denne appen er lite krevende for meg å bruke. helt uenig / uenig / nøytral / enig / helt enig	
3. Jeg kan bruke denne metoden til å tracke humøret mitt helt uenig / uenig / nøytral / enig / helt enig	
4. Denne måten gjorde det enkelt for meg å tracke humøret mitt helt uenig / uenig / nøytral / enig / helt enig	
5. Denne appen motiverte meg å tracke humøret mitt helt uenig / uenig / nøytral / enig / helt enig	
6. Denne appen fikk meg til å få mer innsikt i hvordan humøret mitt endrer seg helt uenig / uenig / nøytral / enig / helt enig	
7. Jeg likte å bruke denne appen helt uenig / uenig / nøytral / enig / helt enig	
8. Jeg liker hvor lett det er å forholde meg til appen helt uenig / uenig / nøytral / enig / helt enig	
9. Denne måten å svare på spørsmål passer meg som en person helt uenig / uenig / nøytral / enig / helt enig	

Appendix H - Student survey

Student survey regarding the use of mental health apps

The science project is a master thesis at the University of Bergen (UiB) in the institute of information and media science and Centre for the Science of Learning & Technology (SLATE).

Purpose
The purpose of this project is to gain insight into how to best design a mental health app for students, and investigate which attitudes students have towards usage of such apps.

Your Information
All information is anonymized, so participants of this project will not be recognized in the thesis. The data being stored will be deleted when the project ends, latest the 1st of June 2021.

It is voluntary to participate.

Instructions
Please respond to the questions as honestly as possible, and do not dwell too much on each question.

Contact
For any questions regarding the survey, please contact master student;
Astrid Hamre-Os, e-mail: Astrid.Hamre@student.uib.no

- Are you a student?
  - Yes
  - No
- Which field are you studying? (Open answer)
- Gender? (Choose ONE alternative)
  - Male
  - Female
  - Other
  - Do not wish to answer
- Would you like to use a mood tracking app to monitor your mood? (Choose ONE alternative)
  - Yes
  - No
  - Not sure
- If yes; What would you use a mood tracking app for? (Open Answer).
- If yes; What do you wish to accomplish from using a mood tracking app? (Open Answer).
- If yes; How often do you think you will track mood ? (Open answer).

- What would motivate you to use a mood tracking app? (Open Answer).

- Which types of data would you consider ok to register in a mood tracking app? (Choose all the answers you want)
    - Contact Info(Name, age, address, phone number)
    - Medical Diagnosis
    - Your mental health history
    - Your mood statistic
    - Notes regarding activities when having a certain mood
    - Notes regarding your thoughts when having a certain mood
    - None of the data above.

- Would you be willing to share the registered data with a professional/psychologist? (Choose ONE alternative)
    - Yes, all the data.
    - Yes, some of the data
    - None of the data
    - Not sure
- If yes; which type of data are you willing to share? (Choose all the answers you want)
    - Contact info
    - Medical diagnosis
    - Your mental health history
    - Your mood statistics
    - Notes regarding activities when having a certain mood?
    - Notes regarding your thoughts when having a certain mood?
- Can you think of other types of data that you might like to register? (Open answer)
- Can you think of any advantages from using a mood tracking app?(Open answer)
- Can you think of any disadvantages from using a mood tracking app?(Open answer)
- Which aspects do you consider important for you to use a mood tracking app? (Choose all the answers you want)
    - Aesthetically pleasing design
    - Security
    - Possibility to contact professionals
    - Being able to see mood statistics
    - Possible to register your own notes
    - None of the above

- Which aspect do you consider MOST important? (Open Answer).
- Are there other aspects that are important for you to use a mood tracking app that was not mentioned in the alternatives? (Open Answer).