

The Design and Evaluation of a futuristic mobile app for monitoring mental health

Submitted September 2016, in partial fulfilment of the conditions of the award of the degree
MSc Human-Computer Interaction.

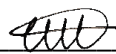
Evi Nikolaidou

Student ID: 4336685

School of Computer Science

University of Nottingham

I hereby declare that this dissertation is all my own work, except as indicated in the text:

Signature: 

Date: 11/09/2019

I hereby declare that I have all necessary rights and consents to publicly distribute this dissertation via the University of Nottingham's e-dissertation archive.

Abstract

One in four people in the UK is experiencing a mental health problem each year (Marzano, et al., 2015). A person's mental health consists of his physiological and emotional wellbeing and it can, therefore, affect the way we feel and think. Unfortunately, mental health is often neglected. As a matter of fact, "mental health" and "physical health" should not be separated because the former can have a serious impact on the latter and vice-versa. In recent years, mobile applications are gradually approaching mental health. Most applications are either standalone self-monitoring apps or complex systems with wearable sensors (Marzano, et al., 2015). This project aims to design and evaluate a mobile app prototype that will allow the users to monitor their mental health, understand what triggers them and find solutions to their problems.

Keywords: mental health, mobile apps, mHealth, wearable devices, prototype

Acknowledgements

Throughout the implementation of this project, I received a great deal of support and assistance. Therefore, I would like to thank a few people that helped me complete this project.

First, I would like to thank my supervisor Dr Max L. Wilson for his support and guidance throughout the summer. His knowledge and guidance were vital for the completion of my thesis. The door to his office was always open when I needed assistance and he was always ready to answer any inquiries. Thank you for allowing this paper to be my own work while guiding me in the right direction. Thank you for guiding me in the right direction in order to develop this project in my own way.

I would also like to thank everyone who participated in the focus group and the evaluation process.

In addition, I want to thank my family for their practical and moral support and for lending me their sympathetic ear. Thank you for always being there for me and for encouraging me during my years of study and through the process of developing this project. To my sister Niki, thank you for having those long discussions with me even about the smallest of things only because wanted to make sure everything was perfect.

Finally, I wouldn't be able to complete this project without my friends. Thank you for your patience and moral support in these past few months. Special thanks, to my dear friend Antonia for her hospitality during the last few weeks before the thesis submission.

Table of Contents

Abstract	2
Acknowledgements	3
Table of Contents	4
Introduction	6
1. Literature Review	8
1.1 Mental Health in the 21 st century	8
1.2 mHealth	11
1.3 Mobile Applications for Mental Health	13
1.4 Wearable Devices for Mental Health	14
1.5 Similar Devices and Mobile applications	18
1.5.1 Spire Stone	18
1.5.2 WellBe	19
1.5.3 Feel	19
1.5.4 Leaf nature and leaf urban	20
1.6 Risks and Ethical Concerns	21
2. Methodology	23
3. User Study	26
3.1 Focus Group	26
3.1.1 Participants	26
3.1.2 Setting	26
3.1.3 Procedure	27
3.2 Personas and Scenarios	35
3.2.1 Creating Personas	35
3.3 Creating Scenarios	39
3.3.1 Kalyn's Scenario 1	39
3.3.2 Kalyn's Scenario 2	39
3.3.3 Dean's Scenario 1	40
3.3.4 Dean's Scenario 2	40
3.3.5 Emma's Scenario 1	40
3.3.6 Emma's Scenario 2:	41

3.4 Final Requirements	41
4. Designing the prototype.....	43
5. Evaluation	54
5.1 Participants and Setting.....	54
5.2 Procedure	54
5.2.1 Completing the tasks.....	55
5.2.2 Interview	56
5.2.3 System Usability Scale (SUS) questionnaire	60
References	62
Appendices.....	66

Introduction

Approximately, twenty per cent of adolescents in the developed world are affected by a mental health related problem (Kenny, et al., 2016). The massive development of mobile applications in the last decade, gave a new solution on this matter. Mobile health technologies are considered as a promising tool for encouraging people to take care of their own mental health (Schnall, et al., 2015). So far, science is correlating physical signals with cognitive activity. However, it is a matter of time before our smart watches start to track our mental health as easily as our physical activity (Wilson, et al., 2018). Considering that mobile technologies are embedded in our everyday life, mental health apps have the benefit of existing on a device which we have access to almost every minute of the day. Furthermore, one of the biggest advantages of mobile technologies is that they can provide discreet access to mental health services directly to users everywhere even in countries where mental illnesses are stigmatised (Zhao, 2006).

The most common issue with the current available mental health related applications is that they often don't follow the Human Computer Interaction (HCI) principles. This is vital because the user experience (UX) will determine whether the user will reject or accept the app. Moreover, a vast majority of the mental health related applications are not taking full advantage of the ubiquitous technologies that modern smartphones have. Other issues that existing applications have, is that they don't include all aspects of mental health and are not necessarily including solutions to the problems. Many applications don't give any directions on how to actually improve your mental health. Furthermore, not all existing apps give details on when or why your mental health changed through the day. The purpose of this

project is to develop a prototype that includes all aspects of mental health, identify the reasons why it changes during the day and give suggestion on how to improve your overall cognitive health.

The aim of this project is to design and evaluate a mobile app that focuses on monitoring the mental health of the user. This app should be able to display the results in an effective and efficient way. Moreover, by the end of this project the following six objectives should be achieved. The objectives are (1) to review the background to mobile applications based around existing academic literature on mental health as well as to produce an academic literature review on the general topic. (2) to investigate and to analyse similar mobile apps and understand their advantages and disadvantages. (3) to collect suggestions and views from potential users about the ideal mobile app for monitoring mental health, ideally using the focus group method. (4) to design an effective and unique prototype of a mobile app about mental health. (5) to test the prototype to a diverse group of potential users, and finally (6) to formally document the project process in a formal report.

This paper is divided into seven chapters. The first chapter includes a detailed literature review. The literature discusses mental health in the 21st century, introduces mobile health technologies and describes self-report mental health mobile applications and wearable devices for mental health. Furthermore, it gives examples of wearable devices and applications and analyses the ethical concerns of those technologies. The second chapter analyses the methodology which was followed during the development of this project. The third chapter goes over the research methods that helped identify the requirements for designing the app. In the fourth chapter, there is an extended analysis of the design process that embraced both lo-fi and hi-fi designs. The fifth chapter explores the evaluation process that took place in order to test the design and review the results along with the changes that had to be made. The sixth chapter examines the outcome of the project and highlights the limitations it faced. Lastly, the

final chapter concludes the project and evaluates whether or not the project has successfully completed the objectives.

1. Literature Review

1.1 Mental Health in the 21st century

According to the World Health organization, mental health is described as “a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community.” (World Health Organization, n.d.). Unfortunately, almost every family has in some way been affected by a mental health problem (Fuhrer & Keyes, 2019). Research has shown that modern life has embedded in our lives, stressful experiences and despite how small or big they are, they can have a negative impact in our mental health. Mental disorders are responsible worldwide for 32% of years of disability and 13% of disability adjusted life years (Kilbourn, et al., 2018). Mental health problems can affect everyone regardless of age, gender or social background. According to Kathleen R. Delaney et. al., (2019), in 2013 almost 20% of children have been diagnosed with a mental health problem. University students are even more vulnerable as they are at an age where mood changes and anxiety disorders are prone to begin before the age of 24 (Farrer, et al., 2013). A study produced by Blanco, et al., (2008) has shown that almost half of the university students that took part in the research had a psychiatric episode at some point in their lives.

The most prominent problem is that people with poor mental health tend to avoid seeking help. A Norwegian survey was conducted in schools with teenagers aged 15-16 years old. It showed that even among the students with the highest symptom levels of anxiety and depression, only a third had sought

professional help (Rickwood, et al., 2007). Research has shown that young men are less likely to seek professional help than young woman. According to Ellis, et al., (2013), this could be a result of toxic masculinity's which supports that men shouldn't endure emotional problems. In their research, they found out that young men (in Australia) avoid talking about mental health issues or even listening to others talking about this subject. Revealing personal information to people other than their closed circle, is considered as "over-sharing" and would not encourage them to seek professional help unless they think it is necessary. Those results are corresponding to Hassan, et al., (2016) research has shown that Syrians that were affected by armed conflicts are ignoring their mental health. In Syria and many other countries, expressing emotional suffering is socially acceptable but it is also considered to be a normal aspect of life. Therefore, seeking help for mental health issues can be perceive as embarrassing and shameful. They are afraid of being deemed "mad" or "insane" by their society.

Many studies have shown that social ties have a significant impact on mental health. For example, social isolation or fewer close relationships are perceived as symptoms of depression. However social influence can lead not only to positive psychological states, but also to negative ones (Kawachi & Berkman, 2001). Over past decade, mobile technologies have become an important part of our everyday lives. Mobile connections have officially surpassed the number of people in the world, with 35% of people owning a mobile device or just a smartphone, worldwide (Anon., 2019). As a result, 92% of people a from ages 12 to 17 are going online every day. In addition, 71% of teenagers use more than one social network. Unfortunately, the amount of time they spent online has been associated with increased mental health problems among adolescents, including internalizing and externalizing their problems (George, et al., 2018). People with pre-existing mental health problems are more likely to spend more time online to compensate for their lack of social skills. Also, Kross, et al., (2013) has shown that daily use of Facebook is associated with negative mood and depressive symptoms. On the other hand, the increased use of social media can play a significant role in developing new approaches to improve mental health. It has been

reported than young people are seeking information and support for their mental health online. Furthermore, web-based intervention about anxiety and depression has positive effects in treating mental disorders with moderate to large effect sizes (Farrer, et al., 2013).

Mental health should not be confused with mental illness. Mental Health is more than just the presence or absence of feelings. It indicates that the individual is functioning well in all aspects of their lives. This includes having trusting relationships, trying to become better people, having a general direction of their lives along with an overall self-determination. (Keyes, 2002). However, a mental illness is a condition that affects the way we think, feel and interact with other people. There are several mental illnesses, and each one has different symptoms that impact people in different ways (Division, 2015). The most common mental health problems in Britain are depression and anxiety disorders with 7.8% of people meeting the criteria for a diagnosis. Depression will affect 4-10% of people in England in their lifetime (Anon., n.d.). Some of the most common symptom of depression are feeling low and losing pleasure in things that you normally enjoy. (Anon., 2019). On the contrary, anxiety can involve excessive worry and dread that you cannot stop as well as difficulty in concentrating (mind.org, n.d.).

Like most health-related issues, mental health can be confronted by early intervention and regular monitoring. There are many studies that prove that these manners of confrontation can make a notable change in the mental health of the individual. For example, a research contracted by Rickwood, et al., (2015) included analysing the clinical journey of 24,034 participants that are clients in Headspace. The results showed that one-third of the clients has reduced their psychological distress and 60% of the clients have experienced significant improvements on their mental health. Therefore, it is important to promote early intervention and to design intervention that are action-based, seen as relevant and focused on changing behaviours and stigmas (Ellis, et al., 2013). In addition, Fuhrer & Keyes, (2019)

suggest that the best practices to improve mental health must require methodical and rational science that monitors behaviours in short and long term.

1.2 mHealth

Throughout history, humankind managed to overcome many challenges. Many factors are responsible for this and one of them is technology. The rapid development of technology in the last few decades is promising for a lot of sectors. One of them is mobile health (mHealth). Is it possible to use our smartphone devices for our health's benefit?

The history of e-Health systems started in the beginning of 2000 though, it was mainly on EHRs. The big awakening of e-Health happened in 2011 when many health technologies had commercialized (Silva, et al., 2015). The most important technologies include fatal heart rate monitoring, a mobile health record system for paediatric HIV and mobile image transmission for diagnosis. The iPhone 2G, in 2007, triggered the evolution of smartphones and applications. Thus, by the end of 2010 more than 200 million mobile health applications were developed and about 70% of mobile users were interested in downloading mHealth apps (Silva, et al., 2015).

Mobile technologies are becoming an essential part of our life. Typically, adults spent around 3 hours per day on their mobile phones (George, et al., 2018). The use of mobile health apps has been growing during recent years; however, it is still in early stages. Those applications are either free or have some fees (Krebs & Duncan, 2015). Mobile Health apps give the opportunity to the users to access information and educate themselves about their health. Moreover, they help users with identifying symptoms and managing their own mental health and wellness, while suggesting the right treatments. Due to the efficiency of mHealth tools, many people can get support at the same time, hence reducing long wait lists. Furthermore, these apps give you the opportunity to monitor yourself 24/7 and provide immediate

support (Olff, 2015). It is also proven that mobile apps have helped doctors during assessment and diagnosis processes. Specifically, “50% of doctors reported that apps facilitate diagnosis during on-call work where’s 43% reported apps helped them interpret laboratory values.” (Marley & Farooq, 2015)

For many people, checking their symptoms on the internet is often a common practice before going to the doctor. Young people in particular are using online resources to get information about everyday health issues such as colds and sprains, learn about healthy eating habits, tips for getting better sleep or how to cope with stress (Wartella, et al., 2016). Online self-tests and many mobile applications have a questionable quality. The main issue is that not all mobile health applications are scientifically approved. mHealth in general has to face a few challenges. According to Olff (2015), there are concerns whether this kind of applications are going to be used. Moreover, the majority of mobile health applications are able to give information about a subject but nothing further (Krebs & Duncan, 2015). Considering, this, end-users are recommended to take part in the design. Other challenges are the security aspect of the applications, the efficiency of the design and last but not least the cost (Olff, 2015).

There is an enormous number of mobile apps available. Nevertheless, research has shown that most health applications are regarding Diabetes, Depression, Asthma and Migraines. (Perez, et al., 2013). Those applications are either tracking or educating the user and they are not always clinical. Another study, regarding only the Health and Wellness applications available on iTunes has shown that the three dominant applications available are about fitness and training, health resources and diet or calorie intakes (Sama, et al., 2014). What is also very disconcerting is that less than 10% of the applications are about mental health. Despite that, these results are understandable because there is great demand for weight loss, calorie tracking and physical activity applications (Krebs & Duncan, 2015).

1.3 Mobile Applications for Mental Health

There are different types of mobile health apps. Some mobile applications are stand alone, self-report apps that require from the user to add new information periodically. For example, a migraine app will ask information such as the duration of the migraine and how strong it was (Perez, et al., 2013). Another type of mobile health application needs a wearable device to help you monitor your health. The external device collects sensor-based data in order to give the right information or solutions. Other mobile applications that are meant to help mental health are targeting a specific area. This might include meditation, journaling, education or other apps. Also, many apps are a combination of the all types mentioned.

Although, the most popular health apps, are associated with monitoring eating habits, weight loss and exercise, it is important to highlight that one fifth of smartphone users have downloaded a medical or health related app (Lupton & Jutel, 2015). The demand and the development of mental health apps has been increasing in recent years. A vast majority of computer-based monitoring programs that have been developed are targeting mental health. Cybertherapy is targeting conditions like depression, anxiety, stress, bipolar, substance and eating disorders (Harrison, et al., 2011). It is estimated that almost two-thirds of the market will be covered by self-monitoring apps (GAGGIOLI & RIVA, 2013). Health related apps are adaptable, efficient and mobile due to the ubiquity of the contemporary mobile devices and their minimal development cost (Sama, et al., 2014).

The social and contextual factors of someone's life, play an important role in the development of a disease. Thus, the mobility of smartphones gives mental health applications a great advantage. Mobile apps are providing access to behaviour-based data, that are used to be available only after constant observation or self-report. Having access to these data in real time can improve the sensitivity of measurement of many of the common outcomes measured by studies in clinical psychology (GAGGIOLI &

RIVA, 2013). The users can self-monitor their mental health not only for self-help but also to share with a therapist.

Initially, self-reporting methods were used by psychiatrists in the form of paper diaries (Harrison, et al., 2011). This method however is relying on the individual, and their ability to remember to carry their diaries with them all the time. People often forget to use them, or they are writing after a long period of time. As a result, there is inaccuracy in their diaries due to memory errors. Mobile phones can provide real-time monitoring, a collection of situational and behavioural information as well as triggering points and mood patterns. Therefore, there is no surprise that studies have shown, that there is a high level of engagement in this method (Harrison, et al., 2011).

One of the advantages of ecological momentary assessment (EMA), was that “the ability to assess temporal relationships between variables, high ecological validity and high detail information on subjective experience”. Although, (EMA), used to benefit from the paper diary method, the development of mobile technology can provide both quantitative and qualitative data (GAGGIOLI & RIVA, 2013). Smartphones are now ubiquitous and offer psychiatry far more than just journaling (Torous, et al., 2015). Mobile technologies are able to collect far more complex data. They can collect data of high velocity, high volume and high variety. This type of data can help many medicine areas, but it appears that psychiatry can ~~be~~ benefit the most from this (Torous, et al., 2015).

1.4 Wearable Devices for Mental Health

The use of wearable devices has created great new opportunities in the field of mobile health. Wearable devices with the combination of mobile applications can give the user a variety of different aspects regarding their health and also promote a healthier lifestyle. The most popular health related wearable devices are targeting fitness and exercise and have been proven to have positive effects on physical

health (Wartella, et al., 2016). As mentioned before, mental health and physical health are interdependent. Therefore, could this type of devices, help people with mental illness? According to Brown, et al., (2010) patients with serious mental illness, like schizophrenia spectrum or mood disorders, have poor physical health. Wearable devices and the accompanying smartphone application can increase the scalability and impact of existing interventions to promote physical activity to people with mental health issues (Naslund, et al., 2016). In addition, the numerous capabilities of smartphones and bio sensors, existing today can give a broad view, on everyone's mental health. Being able to track your mental health, can benefit everyone, not just people with mental health issues, as it can help prevent mental health problems. "Positive mental health is not just the absent of mental health issues" (Kenny, et al., 2016).

The combination of biosensors and mobile applications can collect, elaborate and transmit real time body signal of a patient to their therapist from a distance. Thus, mental health professionals are equipped with physiological and physical activity data that can help them identify the patient's feelings and emotions (GAGGIOLI & RIVA, 2013). In addition, users can be encouraged to self-track and thus minimize the need for frequent interaction with mental health professionals (GAGGIOLI & RIVA, 2013). How can we use sensors in mental health? Firstly, raw data from sensors should be converted into meaningful information regarding the individual. This should include behaviours, thoughts, emotions and clinical states or disorders. The following figure 1, shows how raw sensor data can be transformed into features. Features can identify behavioural markers that shows information regarding behaviours, cognitions and emotions and can predict clinical states (Mohr, et al., 2017).

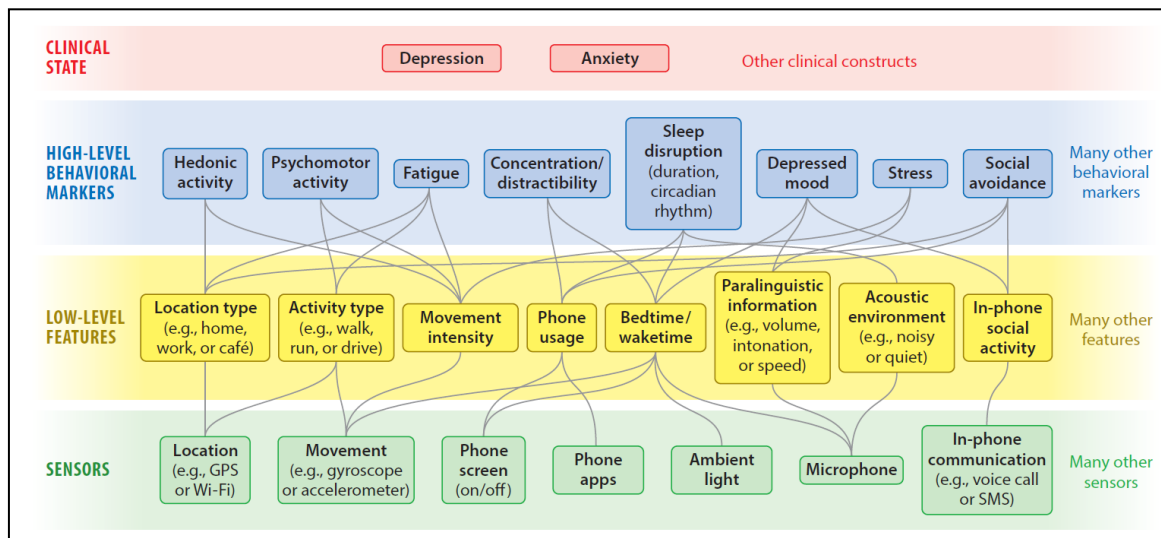


Figure 1: Example of a layered, hierarchical sense making framework. Green boxes at the bottom of the figure represent inputs to the sensing platform. Yellow boxes represent features. Blue boxes represent high-level behavioural markers (Mohr, et al., 2017)

Smartphones are already equipped with sensors that can be used stand-alone to track some or some of the behavioural markers. Sleep is an important behavioural marker and it's associated with psychopathological conditions. Insomnia and hypersomnia can be symptoms of depression (Majoe, et al., 2010). For that reason, tracking sleep duration, quality and patterns (bedtime and wake-time) can be incredibly useful for mental health. Mobile phones can track sleep, without the use of a wearable device, with approximately 90% accuracy. This can be achieved by using the sensor of a smartphone, such as accelerometer, microphone, light sensors and screen proximity sensor (Mohr, et al., 2017). On the other hand, some behavioural makers need extra sensors. Monitoring the individual's heart rate can not only show the physical activity level of the user but also help to identify stress and anxiety levels. For example, studies have shown that during work there is a higher heart rate than during leisure time (Sano & Picard, 2013). Furthermore, heart rate variability (HRV) measurements with the combination of movement during sleep, can estimate sleep quality (Majoe, et al., 2010). Moreover, wearable eye trackers can track eye movements which are linked to the central nervous system. Mental disorders often have an effect of eye movements (Vidal, et al., 2012).

Today's technology and biosensors can give a lot of information regarding the human body. (figure2) The next figure shows only some of the technology that can help us obtain tracking data via sensors (Piwek, et al., 2016). By linking the results of all those sensors, we can create a big picture of the user's mental health.

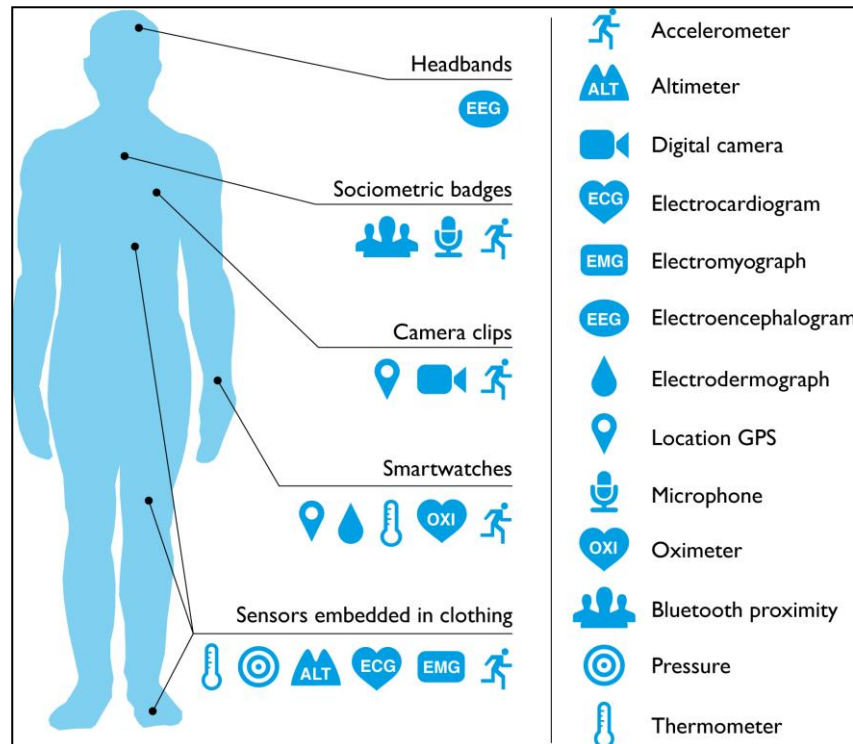


Figure 2: Sensors on human body (Piwek, et al., 2016)

1.5 Similar Devices and Mobile applications

There are several applications and devices that are similar to this project. In this section, four similar devices will be analysed. The aim of the following technologies is to support preventive mental healthcare through health awareness, self-observation, self-care, behaviour change and health promotion. (Kyeong, 2018)

1.5.1 Spire Stone

Spire is a mindfulness and activity tracker that has been designed by Stanford University's Calming



Technologies Lab. It is a clip-on device with the main purpose to increase productivity and decrease stress. Spire is focusing on the breath of the user by monitoring it and collecting the results. For example, slow consistent breaths are an indication of calmness, while

uneven breaths are indicating tension (Hockman, 2015) The device is linked to a mobile app, where it shows your results and visualizes your breath with a floating line. It is also an activity tracker therefore it collects your steps, how many calories you burn and how many minutes you were active. Spire is able to detect changes in the user's mind by their breath patterns and sends notification via the app, encouraging the user to relax. Lastly, it provides guidance for breathing exercises that can grant a healthier life.

1.5.2 WellBe

Wellbe, is a bracelet device and mobile application that aims to support emotional well-being. It was



developed by Zach Sivan and Doron Libshtein, which are executives in the hi-tech industry and published authors in the wellbeing space (Sivan, 2015). Wellbe is monitoring heart complex? algorithms to identify stress and calmness levels. It is also

monitoring your location, the time and your calendar to understand what your stress triggers are, provides well-being exercises and meditations to help the user release stress immediately. It also gives you the opportunity to get notifications when your stress levels are too high and recommends the appropriate balancing exercises. This app doesn't only focus on detecting where your stress is coming from but instead it gives you solutions. The solutions are including a variety of meditation, focused breathing and guided imagination exercises as well as personalized programs and playlists (Sivan, 2015).

1.5.3 Feel

Feel is another bracelet device that aims to track emotion and reduce depression, anxiety and stress (feel,



2019). According to the co-founder of Sention Solutions, George Eleftheriou, makes the argument that technology can make us happier. Feel uses sensors to collect skin temperature, heart rate, skin conductance in order to monitor a variety of physiological

signals during the day and transform it into four emotional patterns (joy, stress, anger, sadness). Feel uses

artificial intelligent methods to identify your emotions and guides you through a cognitive process to reflect on it. Also, it shares the results with a therapist that can meet with you once a week to incorporate your data into your treatment (Diamant, 2018). Last the mobile application can sync your data with your calendar and provide meditation and breathing exercises that are more appropriate for you according to your data.

1.5.4 Leaf nature and leaf urban



Leaf is a wearable tracker that aims to improve the wellbeing of the user. You can wear it as a bracelet, necklace or clip and its mainly focused on women's health. The sensors that are embedded in the device are measuring every step-based movements such as running and walking as well as small movements you make in your sleep. Leaf is tracking your lifestyle habits like sleep, activity level, menstrual cycle and

meditation practices. Using this data, it can predict and prevent stress and give you personalised breathing and meditation exercises (Friedman, 2019). Leaf gives you insights on your sleep quality and how it effects your everyday life. It provides feedback on daily activities, such as steps and calories burned. Leaf help you track your period and fertility calendar. It predicts your stress level and helps you understand how to overcome it and how to reduce it. Last it shows how meditation, activity, cycle and sleep can impact your stress level.

1.6 Risks and Ethical Concerns

The use of mental health applications is a delicate decision. The users need to be aware of the potential risks and ethical dilemmas they are going to face before they start using the app. Fortunately, users are becoming more and more cautious regarding the data and information that shares with several services. According to a research contacted by (Rooksby, et al., 2019), students are more likely to use a system that allows them to control and share their data. In our era, people are relying on technology more than ever before. Transportation, entertainment, banking and healthcare are only of the some sectors which are depending on technology. It is only logical that we must protect our data from potential harm. It was only two years ago, when computer hackers had managed to gain access to the NHS computers. They infiltrated more than 200 000 computers causing major problems in hospitals and clinics (Clarke & Youngstein, 2017). Healthcare is one of the most attractive targets for cyber-attacks due to the valuable data they contain. For example, information regarding health can be used to gain medical services and devices or illegally obtain their insurance companies. There are only a few legal protections and as a result most victims prefer to dismiss the hacker instead of risking losing their insurance. Attacks like this, should encourage organisations to invest in cyber security and users to be informed about the security of their data.

Consequently, mobile applications are facing various different threats. To start off, mobile health applications must inform the users about what kind of data they collect. It is common for mobile health apps to collect data that include the user's demographic and personally identifiable data such as name, age, gender, phone number and email address (Giota & Kleftara, 2014) Secondly there are issues regarding information leaks. Usually, free apps funded through advertisements therefore the user's information is being shared with the developer and maybe with third-party sites too. Information leaks can cause social embarrassment, reputation damage and even identity theft and these are only some of

the common outcomes of information leaks (Dehling, et al., 2015) .In addition Dehling, et al., (2015) highlights the potential of losing information and the potential manipulation of information that can cause to the user to get the wrong treatment.

The most concerning factor regarding the mobile healthcare applications is the validity of the app. According to Giota & Kleftara, (2014) mobile health applications are lacking research evidence which downgrade their efficiency and effectiveness of the app. Research has shown that only a small number of the available health care applications are tested and have accurate and related content results. The amount of mental health applications that have been created by healthcare professional and are based on excessive research is significantly smaller than the number of apps created by individuals with no medical background (Andrian, 2012).

2.Methodology

For this project the methodology model that was used was User-Centered Design (UCD). UCD is a project approach that is focusing on understanding who will be using the end product. In UCD, designers are obligated to involve users as much as possible to the design process, using a variety of different methods and design techniques, to develop an effective and accessible design (foundation, n.d.). UCD has many advantages. For starters it increases sales. Because customers are heavily involved in the design process, it is more likely that the product meets their needs. It created a positive user experience that increases the loyalty and the reputation of the company and finally it saves time. Testing is a long and expensive process, ergo having customers involved in the design process, lots of mistakes are avoided.

According to the Usability Professionals Association, (Jokela, et al., n.d.) outlines the four essential activities in a user centered design project. The development cycle codified in the ISO Standard 13407:

(figure (usability.gov, n.d.)

- Specify and understand the context of use
- Specify the requirements according to the users' needs
- Produce design solutions that meet the requirements
- Evaluate designs against the requirements

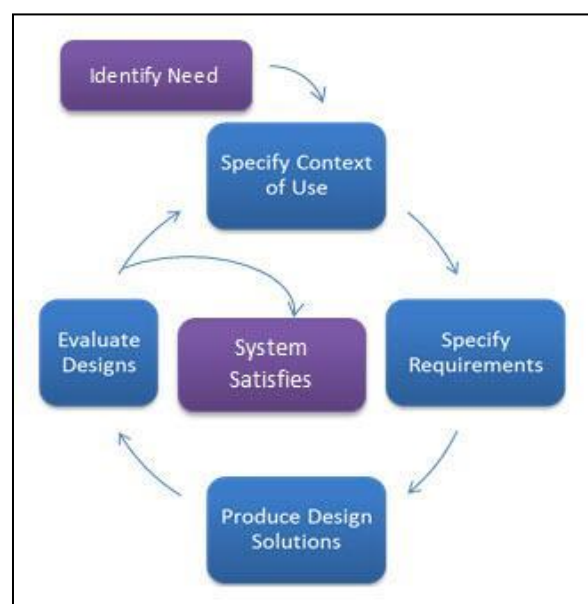


Figure 3: User-Centred Design Diagram

The project includes several stages. There are four big stages: research, design, evaluation and writing. On the first stage, research includes studying about mental health in literature, and exploring the views or recruiters about the design of the mobile app. Secondly the design phase includes creating Lo-Fi and Hi-Fi prototypes. The third stage, evaluation include recruiting participants to test the Lo-Fi and Hi-Fi prototypes. This will help updating the designs. Then, the last phase is about writing the final dissertation including the analysis of the designs. The next figure shows the work process that was followed in order to complete this project.

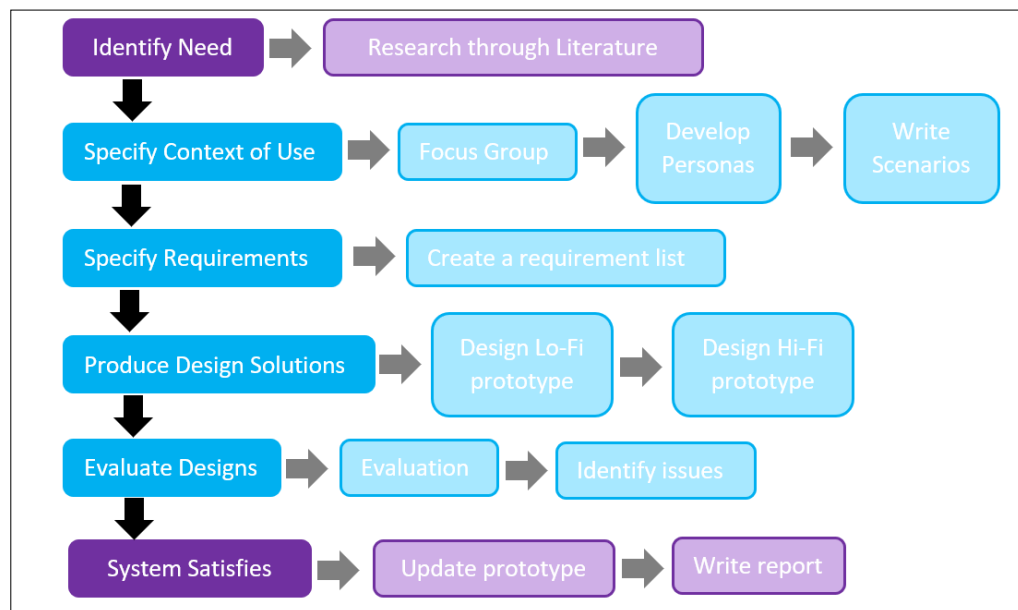


Figure 4: UCD diagram for this project

Throughout the course of making this project, four user design method took place. In order to collect the requirements for the project aside from the literature research, a focus group was conducted. The focus group helped identify future user's thoughts, feelings and concerns about the project and gained their input on the design. Other methods that were used was a usability test, an interview and a questionnaire for the evaluation of the final prototype. The participants were asked to complete a few tasks in order to

comprehend the effectiveness of the prototype. After that they were asked to complete the SUS questionnaire to get more statistical data regarding the design. Lastly participants were asked a few questions in the form of an interview which gave the participants the opportunity to explain what they liked and didn't like about the app.

3. User Study

3.1 Focus Group

The focus group method was used to collect data regarding mental health awareness and to understand what functions people would like to see in a future mobile app that could track mental health. Focus Groups are providing the possibility of a broad range of viewpoints and insights (Lazar, et al., 2010). Furthermore, the discussion that would arise from the focus group could help identify requirements for the app prototype.

3.1.1 Participants

Seven people were invited via phone calls and five people have attended. The group consisted of three men and two women all of them between the ages of 21 to 28. The diversity of this group helped to provide a variety of different points to the discussion. Each of the people who participated comes from an individual social background, has a different age and ethnicity. All participants have an undergraduate degree in a distinct area of study. Their different backgrounds include law, finance, architecture and visual communication.

3.1.2 Setting

Each member of the focus group was contacted at the University of Nottingham at the Coates Café at University Park Campus. The focus group took place on 5th of August and it lasted approximately 90 minutes. Both Drinks and snacks were provided. The participants were asked to read the information sheet and to complete an ethics form. They were also informed that if the conversation made them upset, they could withdraw at any given time. In order to prepare for this scenario an informative leaflet

was printed. The leaflet contains information about feeling overwhelmed and includes the contact information to Samaritans and Mind. Fortunately, the leaflet wasn't needed.

3.1.3 Procedure

During this process I held the role of the moderator and was following a focus group plan, which was split into three sections (See appendix). The moderator's duties are to lead the conversation and make sure that the participants are focused on the discussion points. This can be achieved by asking questions, encourage everyone to participate in the discussion and promote debates (Kitzinger, 1995) The focus group discussion was audio recorded.

To start the conversation the first task that the participants were asked was to write down the first thing that comes came to their minds when they heard the term "mental health". The purpose of this question was to put a start to the conversation. As a result, to this task, they came up with the following words: sleep, alone, psychiatrist, depression, family problems, problems and mental workload. It is important to highlight that two people first came up with the word "suicide", but were asked to change it, in order to not lead the conversation to a sensitive or upsetting path. However, judging from the words the participants have chosen, we can clearly perceive that they view the term mental health as something that brings out a negative light into somebody's life. For this reason, more words were added by the moderator to inspire and guide the participants to the conversation. In the following figure show the final cards. (figure 5)

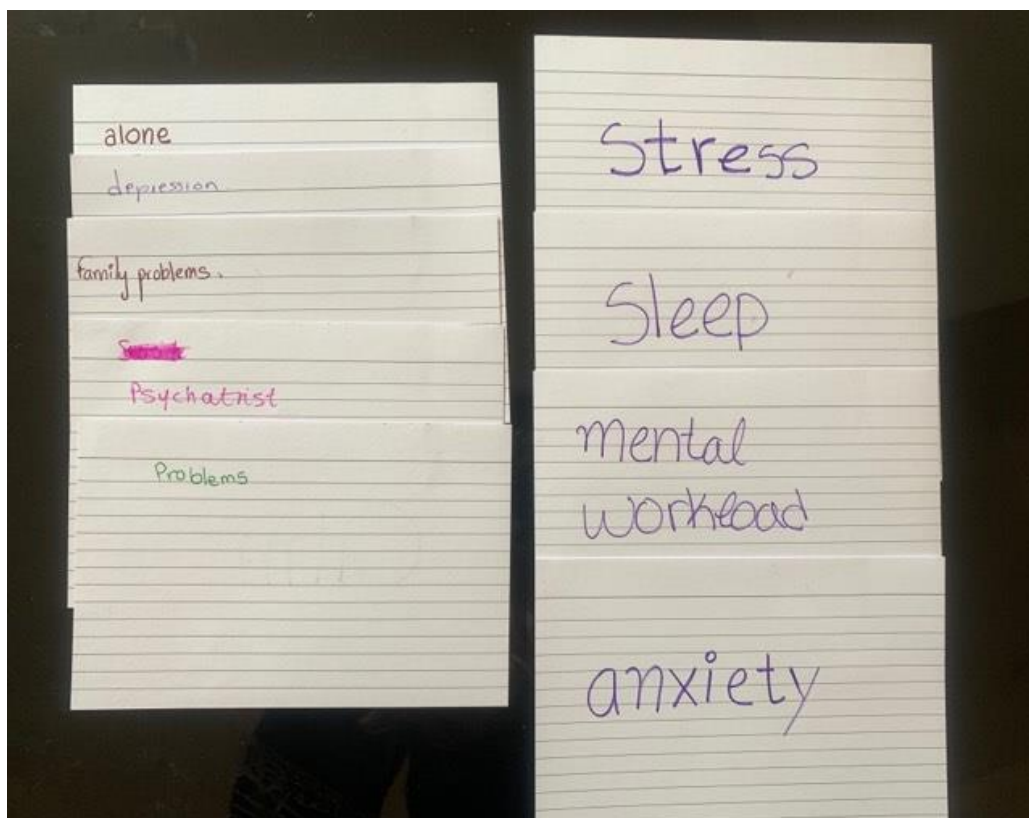


Figure 5: On the left side, the participants cards and on the right my own

Next the participants were asked to discuss their individual opinions about mental health. They generally agreed that family and friends play a very important role in people's lives, and it they can affect your mental health the most. "Everything is about family. If your family doesn't provide you with a mental balance throughout your life or if you have family problems, then you may gain some issues." Also, they had a debate regarding social media and how it affects their mental health on a daily basis. Some people of among the group believed that no matter how mentally balanced an individual is, watching celebrities and influencers on social media can have a negative outcome. Subconsciously you start to feel "like you are not doing enough things in your life". On the other hand, some participants disagreed with these statements as they believed that social media can be good. They are helping them set new goals for themselves, inspires them to travel to new places and adopt a healthier lifestyle by changing their eating habits and motivates them to start working out. This discussion concluded after reaching a middle

ground, “Social media can either affect you positively and help you set goals and achieve things or negatively by making you think that you are not doing enough and that you are essentially missing out on life”.

The question “Could you compare physical and mental health; do you think one is more important than the other?” intended to throw light on how much people value mental health and whether they consider it less important than their physical health. However, this question didn’t require as much discussion as there was no conflict of opinion. All participants agreed that both are important, and they justified that by giving examples on eating disorders. In their example, a person with anorexia starts their journey by wanting to become physically well but due to their mental weakness they become anorexic. Lastly a participant mentioned “Both should be in balance, just like that ancient saying by Juvenal “a healthy mind is a healthy body”.

Moving on to the next part of the focus group, the participants were asked to explain how they would approach the situation if they had a mental health problem. Although nobody disapproved of seeking professional help, all participants agreed that, that would be their last resource. Ideally, they would like to self-reflect on the issue and try to solve it by themselves, then to discuss it with their close friends or their family members and lastly if all other efforts to get better were debunked or ineffective, they would seek professional help. “I think that the problems start and finish with me. So, I would focus on myself and if I can’t solve it, I would talk to friends or to a professional depending on the issues”. However, one member categorically disagreed with that opinion and believed that you can’t solve a mental health problem by self-reflecting. The reason is due to her belief that “if you are someone that thinks about those problems to help yourself and overthinking situations, then self-reflection can lead to bigger problems”. She proceeded to explain that she tends to overthink about situations and over-analyse things. As a result, by only not expressing the issue and attempting to deal with it on her own she is inflicting more anxiety to

herself. This question was asked in order to understand whether or not people feel like going to a professional in order to discuss a situation is consider a bad thing. One participant added “. There is nothing wrong or shameful about going to a psychiatrist, that’s their job, it’s what they’re here for” which can be interpreted as if the participant didn’t have an issue that they couldn’t solve by themselves or with their family and friends. It also shows that the social stigma that is associated with seeking help for mental health doesn’t prevent them from doing so. On the contrary this Australian study, shows that the participants were afraid that their society will render them as “crazy”.

In order to ask the following question, the moderator had to explain what are mobile applications that monitor mental health and provide them with examples by familiarizing them with the Spire and WellBe devices. It was interesting to know that none of the participants have used any similar devices/applications before and that they weren’t aware of their existence. Most participants expressed interest in using one out of curiosity. However, some participants were sceptical about this technology. One participant in particular explained that “I am against this massive development of technology. No, get personal, get human and overcome this by yourself don’t depend on technology. Don’t judge me but for me sometimes technology is too much”. However, this opinion was marginalized as the other participants acknowledged the assistance of technology in medicine. One of the main concerns of the participants is that this kind of applications can produce more issues to someone that already has a mental health problem. Just like the social media debate, they explain that it depends on the individual user how they will view the situation. “This helps you understand if you are okay and keep you in balance. ‘Oh, I was in more stress today than usual so I should be more careful tomorrow’. It depends how you are going to react”. Another concern they had was, that these apps will eventually replace the psychiatrists.

Next, they had to voice their opinions on the following statement, “this kind of technology can help prevent mental health issues”. There were mixed answers to this question. Some people said that they failed to understand how this app can prevent mental health problems while others thought that at some level it can help prevent mental health problems “because it keeps you under control”. This question brought up a discussion about how some people don’t trust technology to give medical advice, or what reasons would make someone use this kind of technology if you they are feeling okay. “But what if I am okay and the app shows I am depressed?” The conversation started to drift into a personal level and out of the scope of the question, hence in order to avoid getting people feeling overwhelmed we moved to the next question.

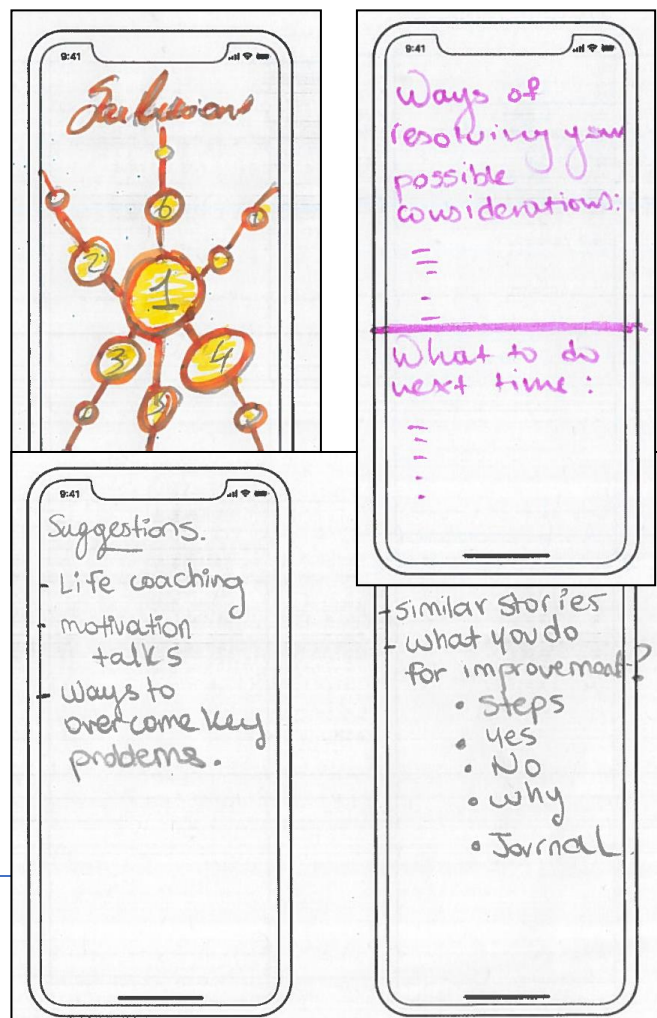
For the next part of focus group, participants were asked to forget the limitations of today’s technology and identify what kind of functions they would like to see in a future mental health tracking device. The participants gave some interesting points. One participant explained that he would like to see an app that is aware of his environment. “I want the app to ask questions like am I okay with my friends, do I have a job? Am I happy with my friends/partner? Did I lose anyone recently? Not being based only on statistics. Like, it could show me that I have been more upset recently while also taking into account that I’ve been going through a difficult time.” Another, suggestion was a function regarding the subconscious mind. Although they expressed their interest in the subject, they didn’t clarify what the “subconscious mind” function would do. Moreover, they suggested that the app should be able to identify parts of your personality that are bad and good, to keep them in mind while trucking you.

Furthermore, they were asked if they would allow a mobile app to truck them 24/7 or for a short period of time. They all agreed that by collecting data all day long they would feel confident about the credibility of their result. Nevertheless, they would like the device to be distinctive, “something like a watch or

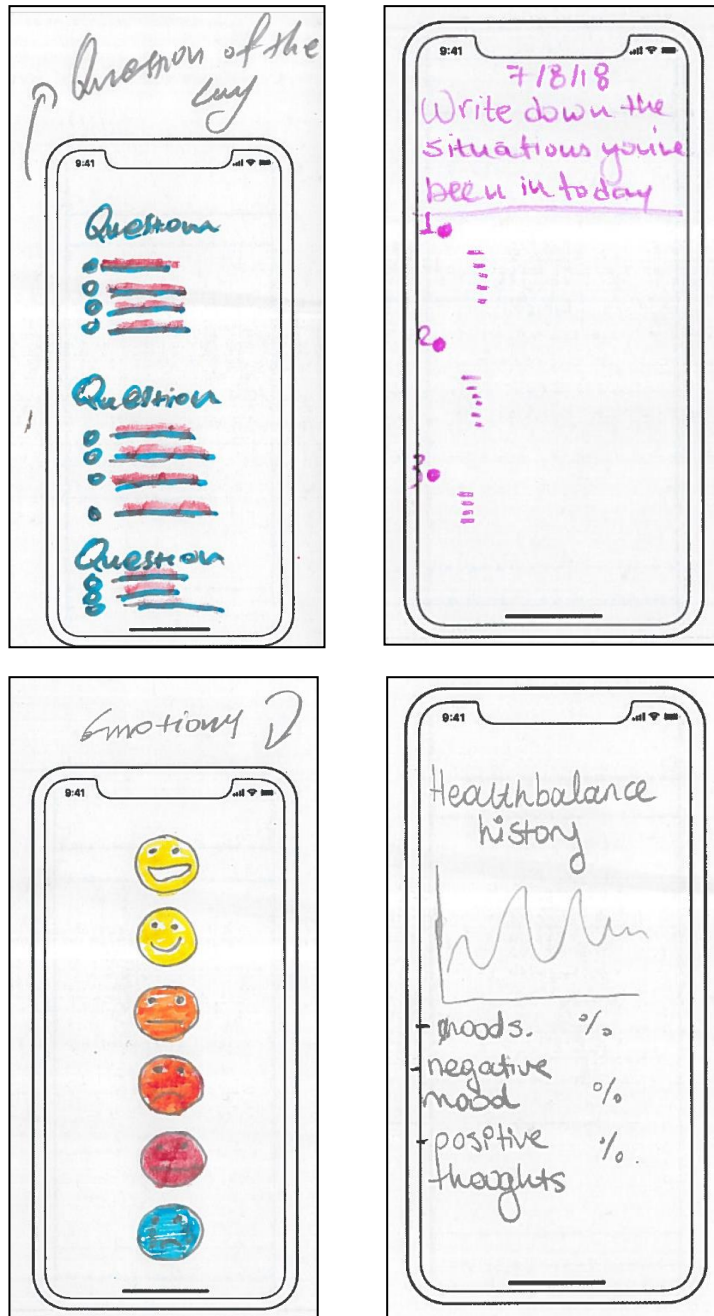
headphones. I wouldn't walk around with a helmet all day." Then, they were asked if they would feel comfortable knowing that the app collects data, like location, app usage, calendar and more. This question gave mixed opinions, but everyone was concerned about what would happen to their data. Two people explained that they don't want to share their data with the app. However, everyone else was more sympathetic, and they understood that this can benefit them. "There are so many apps that are already tracking us so it wouldn't bother me if one more does, especially when its one that is trying to help me."

The last task they had to complete was drawing some interfaces of a potential app. One of the participants didn't feel like drawing and didn't participate in this task. You can see all drawings in the appendix. The next section includes some of their ideas that not only are interesting but also could be useful to incorporate to the final design.

One common theme in their drawing, was an interface with the title "solutions".



Another interesting approach was the use of emojis to identify the mood of the user. (figure) Two people included questionnaires for getting data that could not get from sensors. Next, in this design they tracked “positive thoughts”. This could explain their views on “subconscious mind” that was mentioned as a function that they would like to have. Lastly, some of their interfaces included: meditation, fitness, life coaching and eating habits.



Summing up, the focus group was able to provide a variety of different viewpoints. The discussion however brought up a big issue. The participants are not fully aware of what mental health is. Although they understand that it's important to take care of mental health, the conversation often drifted to the topic of mental illnesses. It is important to highlight the need of education on mental health and the need to take care of it. In the same way that humans need to exercise their body regularly and not solely for the purpose of losing weight.

3.2 Personas and Scenarios

3.2.1 Creating Personas

The focus group and the literature research had led to the creation of three personas. The mobile application should be able to be used by anyone that can use a smartphone device. Therefore, the three personas are representing the target market that would be using this app.

The first persona represent a young person Kalyn aged 23. She has a modern job; she is a lifestyle social influencer. The second persona is representing users in the older age groups. Dean is 44 years old; he is a lawyer and has family. Lastly, is Emma she is representing the teenager users. She is 15 years old and a student.

Picture: 	Persona: Social Influencer Fictional Name: Kalyn Demographics <ul style="list-style-type: none"> • Age: 23 • Education/Job: Social Influencer • Ethnicity: Canadian • Location: Toronto • Family status: Single • Gender: Female
Goals <ul style="list-style-type: none"> • Acquire more followers on her social media • Inspire people live their best life • Become a certified life coach 	
Challenges <ul style="list-style-type: none"> • She works hard to produce the best content for her followers • She struggles finding time for herself as she is always working 	
Views on Technology She owns the latest technology gadgets. She refers to herself as an expert Internet User.	
“A day in the life” I woke up every day at 5am. I have my breakfast while reading a book. I love working out in the morning, I usually go for a run outside but if the weather isn’t ideal, I opt to go to the gym instead. I then come home do some yoga, meditate and get ready for the day. I am really organized and have plan for each day. I started my YouTube channel when I was 18 years old and I soon realised how important it is for my health to be on top of my work. So, some days I am filming new videos, some days I’m editing and some I’m recording my podcasts. I pre-film most of my videos so if I want to take a week of to go on holidays, I don’t have to stress about not having any new content on my channel. I am also training to become a life coach.	

Table 1: Kalyn’s Persona

Picture: 	Persona: Lawyer Fictional Name: Ben Demographics <ul style="list-style-type: none"> • Age: 44 • Education/Job: Lawyer • Ethnicity: British • Location: London • Family status: Married with two children • Gender: Male
Goals <ul style="list-style-type: none"> • He wants to grow his law firm • He wants to spend quality time with his family • He wants to get more clients 	
Challenges <ul style="list-style-type: none"> • He is struggling to balance time between work and family. • Staying on top of work • Staying organised 	
Views on Technology He doesn't think he is an expert, but he knows how to do his job, checking his emails and do basic staff on the internet.	
"A day in the life" Every day, I have breakfast with my family and then drive my kids to school before going to my office. I have a hectic life; every day is different. I usually have a few meetings with my clients in my office or over the phone. Sometimes I have meetings with fellow lawyers to discuss cases or visit crime scenes to get more information. A few times in a week I need to be at court. I usually have lunch with my colleagues and then we quickly get back to work. I spent a lot of time researching and studying to prepare for court days. I leave work late in the afternoon. Sometimes, I get home early and I either help my wife make diner or help my children with their homework. But often I need to work overtime to prepare for the next day at work.	

Table 2: Dean's Persona

Picture: 	Persona: Student
	Fictional Name: Emma
	Demographics <ul style="list-style-type: none"> • Age: 15 • Education/Job: High school student • Ethnicity: Cypriot • Location: Larkana • Gender: Female
Goals <ul style="list-style-type: none"> • She wants to be a doctor • She is studying to get into a good university • She wants to become a better dancer 	
Challenges <ul style="list-style-type: none"> • She is struggling with schoolwork and dance lessons • She is stress over getting accepted to her first-choice university 	
Views on Technology She grew up having access to a tablet and a computer. She thinks she is an expert in using technology	
“A day in the life” I am a high school student. I go to school every day. After school I am doing my homework and attend extra lessons in the afternoon to help me achieve better grades. I want to become a doctor, so I am studying hard in order to achieve the best marks in my exams and get accepted to my first choice of university. In my spare time I love dancing and playing music on my guitar. I have also been attending dance lessons three times per week ever since I was 5 years old. During the weekends I either study more or hang out with my friends.	

Table 1: Kalyn’s Persona

3.3 Creating Scenarios

Scenarios are stories based on the personas that are used in order to extract requirements and to understand why future users would use this mobile application. For this project, two scenarios were developed for each persona.

3.3.1 Kalyn's Scenario 1

Today it a busy day for Kalyn. Her to-do list is full, and she worries that she might not be able to complete all the tasks she wants. She woke up a bit later than usual but continued her morning routine as usual. She made breakfast for herself and wrote in her journal as she had a lot in her mind, and this is a technic that help her focus. She uses her app to journal and read the previous text she wrote. Later, that day, she realizes she could not complete everything and had to move a few tasks for the following day. Kalyn use her app to check her mental health before going to bed. The app told her that she was stressed and recommended a meditation track. She then listened to the meditation which helped her relax and feel like she could accomplish all her task the next day after a good night's sleep.

3.3.2 Kalyn's Scenario 2

Kalyn is very stressed today because she had a meeting with her manager. During the meeting she was presented with ~~to~~ some opportunities that would make important changes to her career. Although she already gave a response, she is now having second thoughts about her decision. Kalyn checked her app and she realized that the meeting caused her negative thoughts and triggered her brain to overthinking. She then decided to ask her manager to postpone any actions until she is sure about her decision

3.3.3 Dean's Scenario 1

Dean had a great day. He was in court all day and he managed to win his case. He checks his app regularly for his mental health. Today the app shows his focus level was high and that he was mostly calm. He knows that being in court is his favourite part of the job. It's no surprise to him that this makes him feel calm.

3.3.4 Dean's Scenario 2

Dean bought this app, in order to manage his stress. His job is very hectic, and he knows that it affects his health. Every day he checks the app to make sure everything is under control. The app shows he is more stressed when he is at his office and calmer at home or when he spends time with his family. For the past week, the app has been showing that his stress levels are very high when he is at work and that his focus level is dropping. The app also suggests some time off. Dean follows the app's instructions and after few days he goes back to work.

3.3.5 Emma's Scenario 1

Emma had a very unproductive day. At school she had a huge fight with a friend. Although she feels like they can overcome this, she is also aware it will take time. After school Emma tried to call her friend and to talk about it but she refused to, so she gave up and sat down to study. Emma is trying hard to focus on her homework. She checks her app and finds out that her mood changed after her phone call from angry to sad. She also noticed that her focus today was low due to excessive time texting. Emma then changed her life question in the app to reflect her situation and then checked the recommended articles for anything relatable

3.3.6 Emma's Scenario 2

Emma had a long day at school today. She checked the app when she arrived home and she found out that her anxiety level was high at school today, and specifically during her History module. She had to give a presentation today and she doesn't like giving presentations in front of her whole class. She wants to know more about anxiety and public speaking, so she finds a video in the app to help her understand how her mind works during an uncomfortable situation.

3.4 Final Requirements

The next table shows the lists of requirements. The requirements were collected from the literature and research, the focus group and the personas and scenarios. Each requirement has a priority level, the "MUST" level has the highest priority, the "SHOULD" has a moderate priority and the "WANT" has low level priority

<i>No</i>	<i>Description</i>	<i>Priority</i>	<i>Source</i>
1	The app shall be easy to use	MUST	L
2	The app shall be straightforward efficient and effecting	MUST	L
3	The app shall collect data through a wearable device	MUST	L
4	The app shall collect data from the phone	MUST	L
5	The app must collect data like location and app usages	MUST	L
6	The app shall have access to your calendar	SHOULD	P
7	The app shall have access to your emails	SHOULD	P
8	The app shall have access to app usages	MUST	P
9	The app must have log in page with password	WANT	FG
10	The app shall allow a mental health check at any point	WANT	L
11	The app shall have an overview interface that shows the results	MUST	L
12	The app shall have a calm interface	MUST	L
13	The app shall have a focus interface	MUST	L
14	The app shall have a mood interface	MUST	FG
15	The app shall use emojis to show mood	MUST	FG
16	The app shall have a negative and positive thoughts interface	SHOULD	FG
17	The app shall have an overthinking interface	SHOULD	FG
18	The app shall have a stress interface	MUST	L
19	The app shall have an anxiety interface	MUST	L
20	The app shall have a sleep interface	WANT	L
21	The app shall have an exercise interface	WANT	FG
22	The app shall have an eating habits interface	WANT	FG
23	The app shall provide chat to professional help	MUST	FG
24	The app shall provide access to profession help via phone calls	MUST	FG
25	The app shall provide recommendation for meditation	SHOULD	FG
26	The app shall provide videos regarding mental health	SHOULD	FG
27	The app shall provide article regarding mental health	SHOULD	FG
28	The app shall promote journaling	WANT	P
29	The app shall save old journaling entries.	WANT	P
30	The app shall check the user environment through questions	SHOULD	FG
31	The app must show triggering points for each emotion	MUST	P, L
32	The app shall truck locations that affect mental health	MUST	P, L
33	The app shall truck the time and duration of each emotion	SHOULD	FG
34	The app shall provide a visualization for each emotion	SHOULD	L, FG
35	The app shall have notes for each emotion that explain the results	WANT	FG
36	The app shall have a colourful and calm design	WANT	P

Table 3: Requirement List

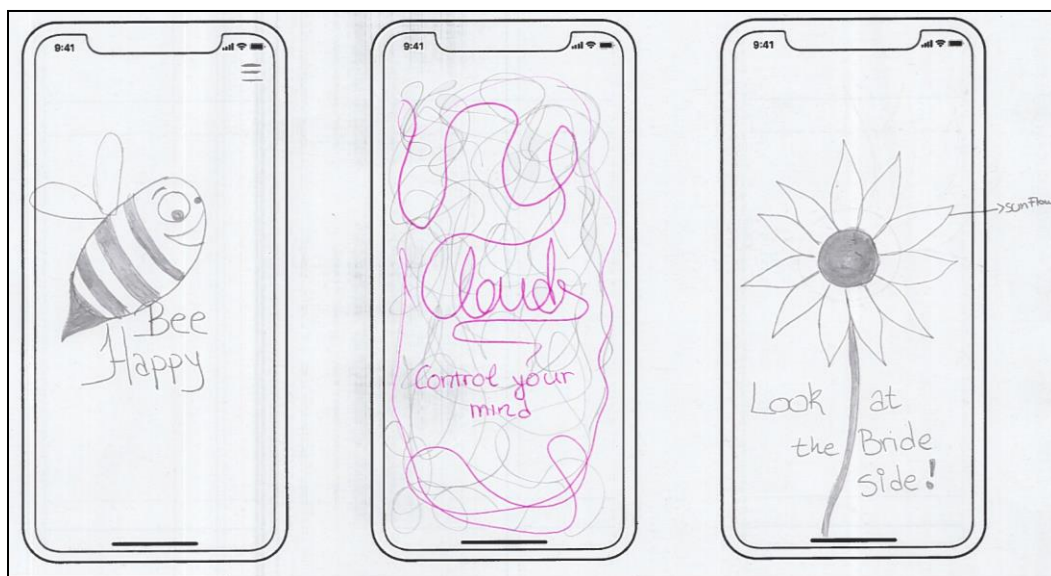
* L=literature, FG= focus group, p=personas

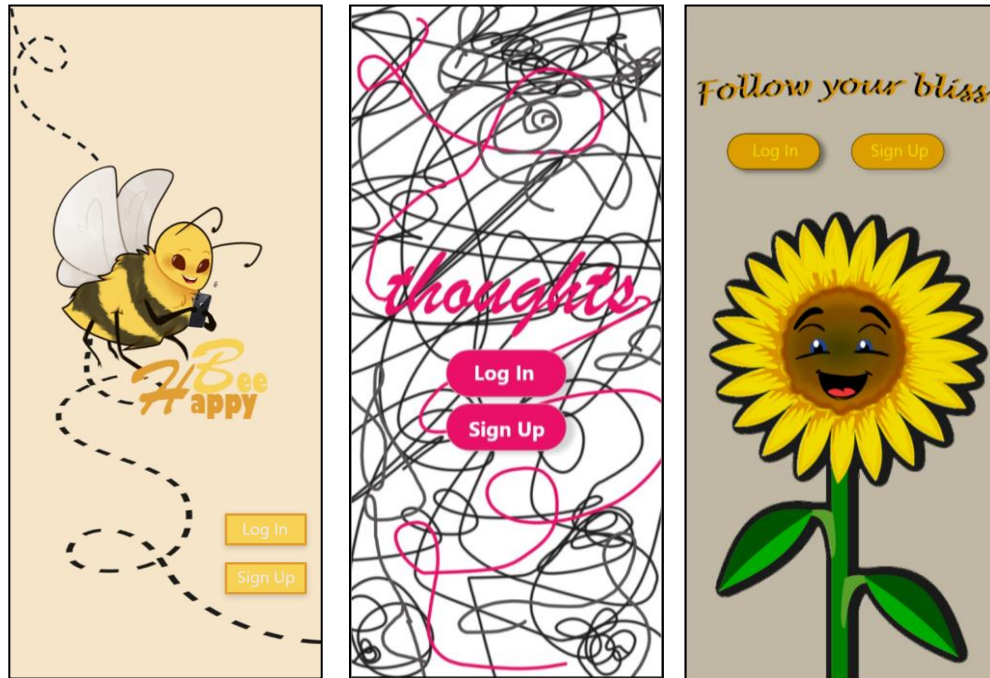
4. Designing the prototype

The design process is split into two sections: low fidelity (lo-fi) and high fidelity (hi-fi) prototypes. The lo-fi wireframes are paper sketches and they help visualize the requirements. The hi-fi wireframes are best described as complete representations of the prototype and they were developed using Adobe XD. The prototype is designed for iOS operating system and more specifically for iPhone X. It was crucial to include both low and high-fidelity designs. The lo-fi prototypes are responsible for the structure of the app while the hi-fi, confirmed the design solution, gave colour to the prototype and contributed to achieving a better user experience. This had a significant importance as it provided a realistic representation of the app for the evaluation process.

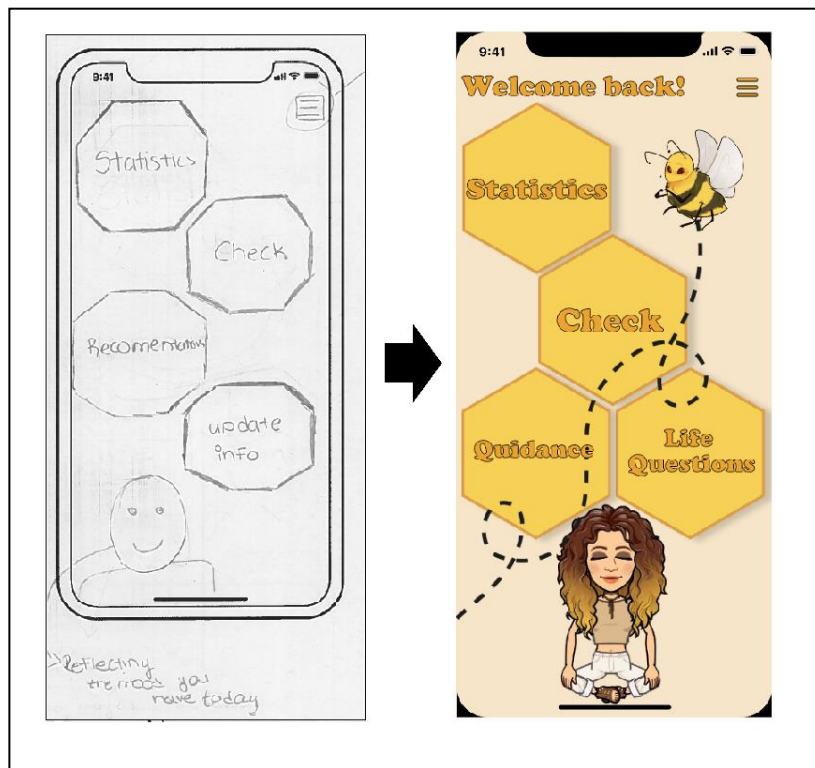
In this sector some of the lo-fi and hi-fi prototypes will be shown. For the full prototypes see appendix.

The first choice was to decide the log-in interface which would determine the whole app design. Three different prototypes were developed. Although, on paper the second design was more appealing, the hi-fi designs couldn't justify it. Therefore, the first design was chosen.

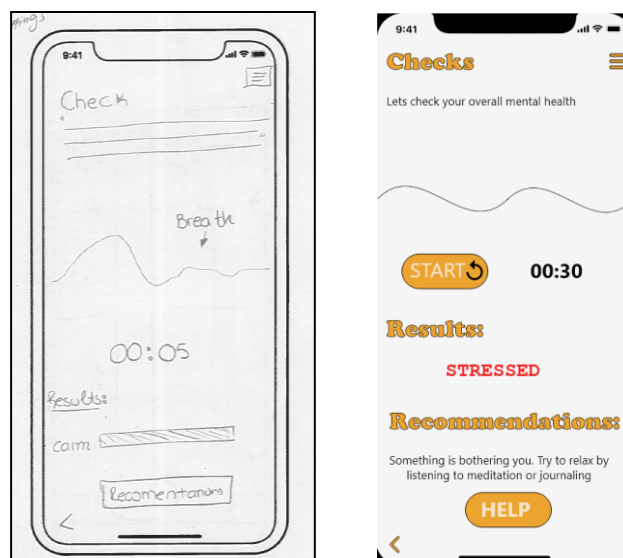


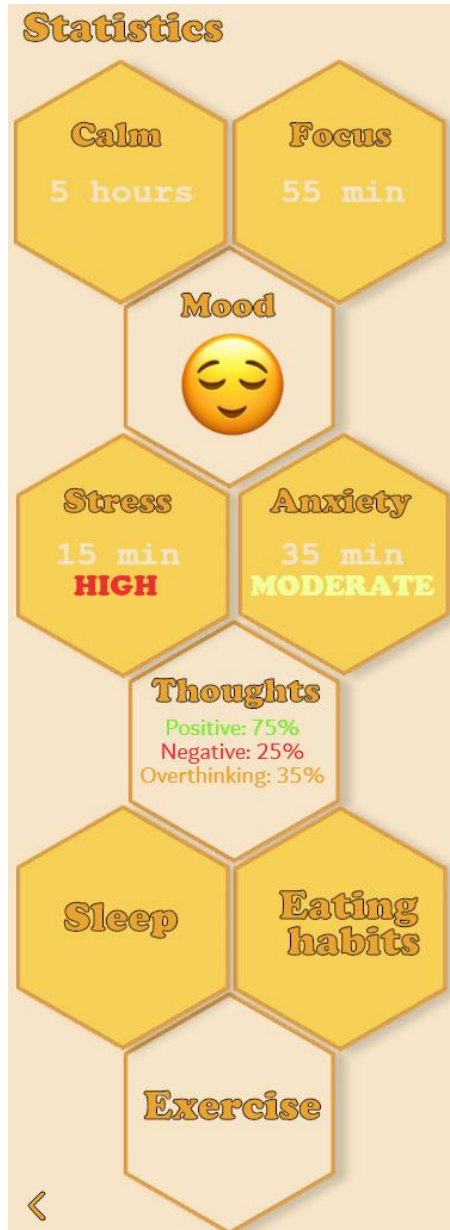


The first page that you see once you log-in the system should show what this app is supposed to do. Four tasks were chosen for this stage. First, “statistics” that will include an analytical approach to all the aspects of mental health that this app covers. Then “Check” is sync with the device and gives you direct results. The “Recommendations” button was renamed “Guidance” on the hi-fi prototype. It provides the user with solutions and information regarding mental health related issues. Last the “update info” button, which was renamed “Life Questions” is there to remind the user that they need to update the questions if something changes in their personal life. At the bottom of this interface the image should reflect the overall mood of the user. For the hi-fi design, the bitmoji is reflecting a calm mood.



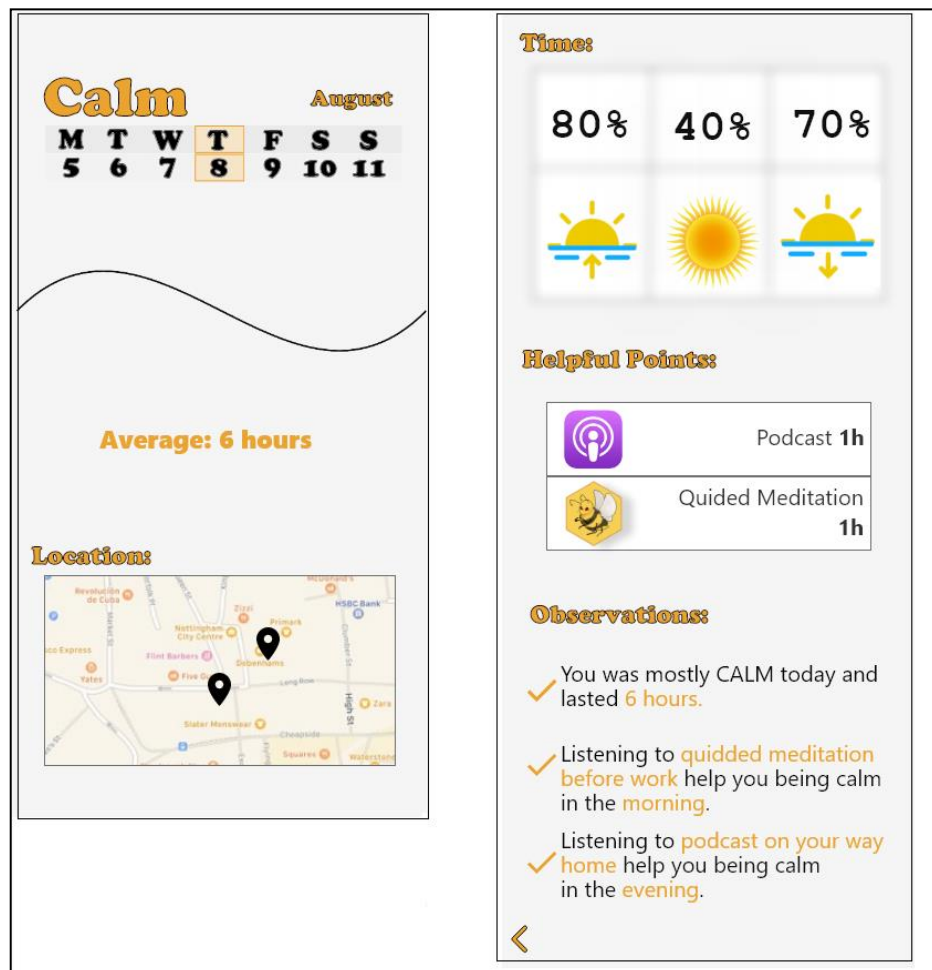
First, the “Check” button, is responsible for checking the mental health of the user in the moment and give results. Although the device should collect data 24/7, this function is allowing the user to test their mental health whenever they want. For example, after they complete a meditation session.



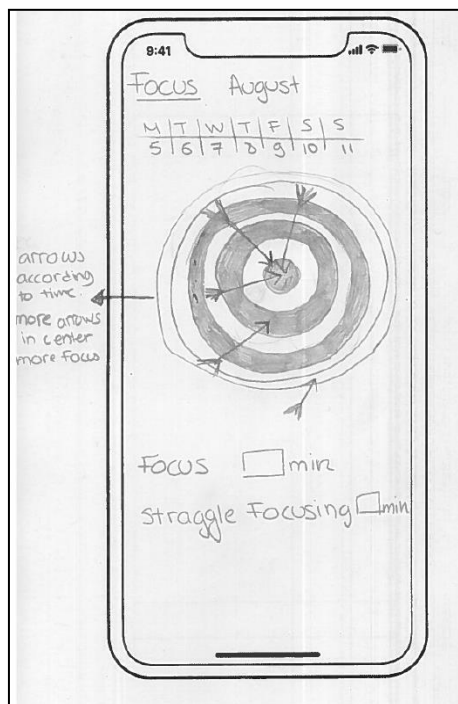
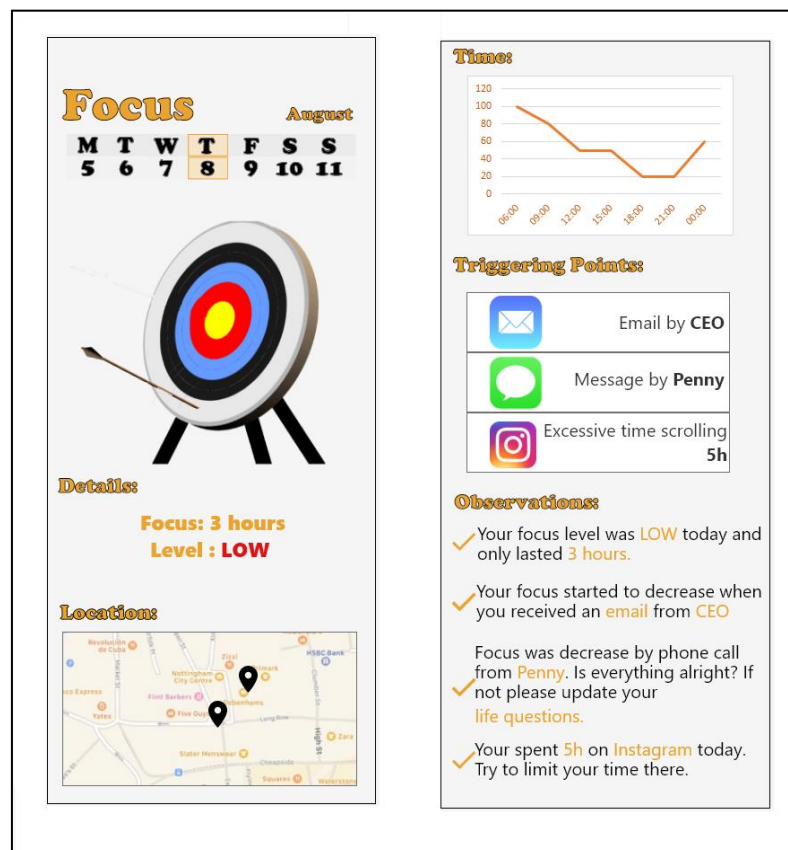


The main focus of the app is the “Statistics”. The statistics include ten different aspects of mental health and shows the overall result of the day. All of them can affect the user’s mental health in some way or form. It’s important to notice that, the “Sleep”, “Eating Habits” and “Exercise” are lacking a lot of information. Even though those sectors could affect the mental health in order to fully develop them a different research should take place, which is out of the scope of this project. However, having those aspects in the application could provide a more complete outcome. The interface for each of this aspect is very similar. Most of those factors have visualization, a time graph, a map, triggering or helping points of the day and observations.

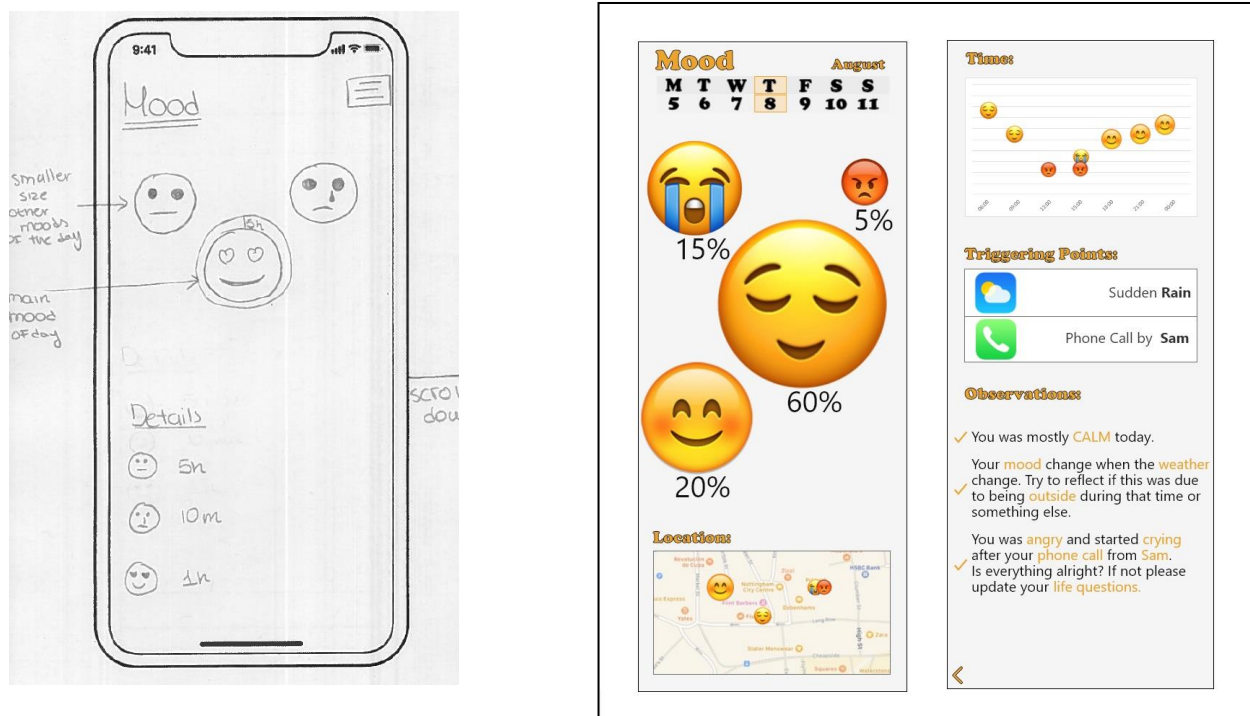
The first factor is “Calm” and shows the amount of time the user was calm. By tapping the hexagon, you can see everything regarding your calmness throughout the day. The visualization for this, is a line that represents your calmness levels. Then there is a map that shows the exact locations in which you were most calm. The “calm” factor is the only factor that instead of a regular graph that shows the time has images. The image is split into morning, noon and evening and has a percentage of the calm levels. The helpful points are getting information from the device and the app itself to show the user what helped them stay calm on that day.



The “focus” factor has an interesting visualization. The visualization represents a target face with an arrow. The arrow shows the level of focus the user had during the day. The paper prototype has multiple arrows which was confusing however during the design of the hi-fi prototype, it changes to only one arrow. The map shows your location during the highest focus level. Unlike “calm”, there is a graph showing the focus level during different hours of the day, from the time you woke up. The triggering points explain what caused your focus to decrease and the observations provide a summary of the data and some recommendations on how to increase your focus level.

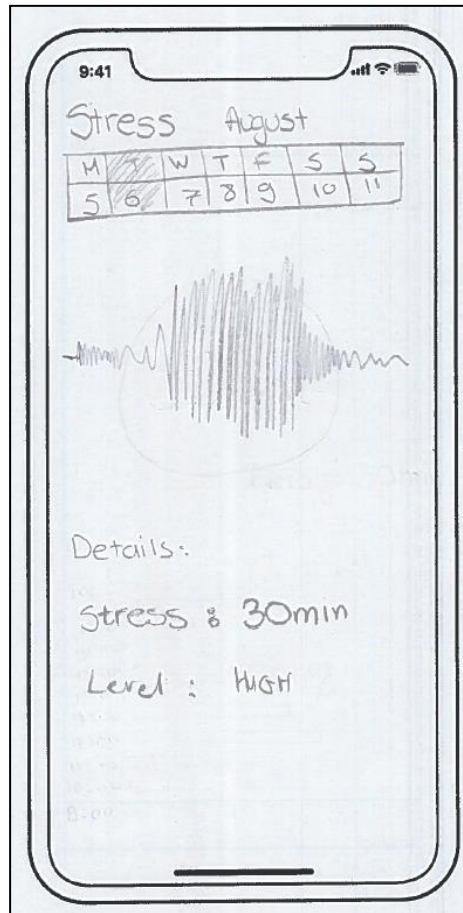
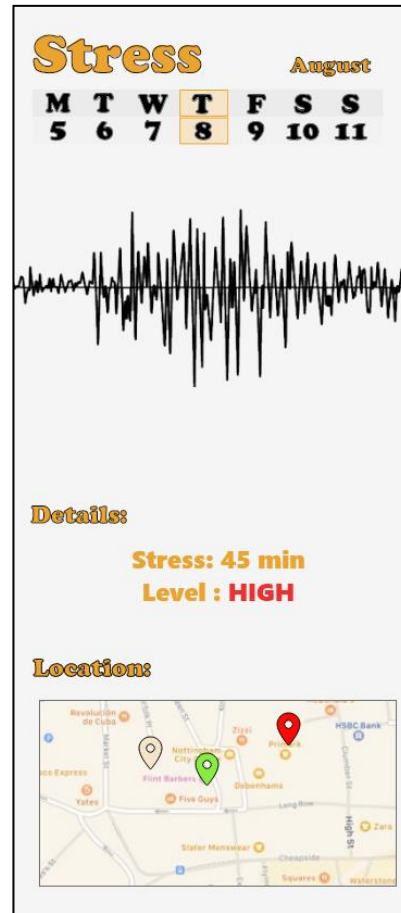


For the design of “mood”, there was a big influence from the focus group. As mentioned before, one of the participants chose to use emojis to identify the mood of the user. For the visualization, all moods of the day are represented with emojis. The size of the image shows how frequently the user felt that way. During the lo-fi design the percentage was not included but to make it clearer during the hi-fi design, the percentage was written down. The design of this interface follows the same pattern with the previous factors. The difference is that on this one, the map shows the mood you were in at each location, using emojis. The time graph is again, using emojis to show the mood you were in during different parts of the day. Lastly, the triggering points identify things that happen, during the times that your mood shifted from one emotion to another. More information regarding this shift can be found under the observations.



The next factor is “stress”. The visualization for stress was a personal drawing interpretation of stress. However, a similar drawing can be found in a scenario drawing exercise for a focus group study conducted by Wilson, et al., (2018). The design of this interface follows the same pattern with the

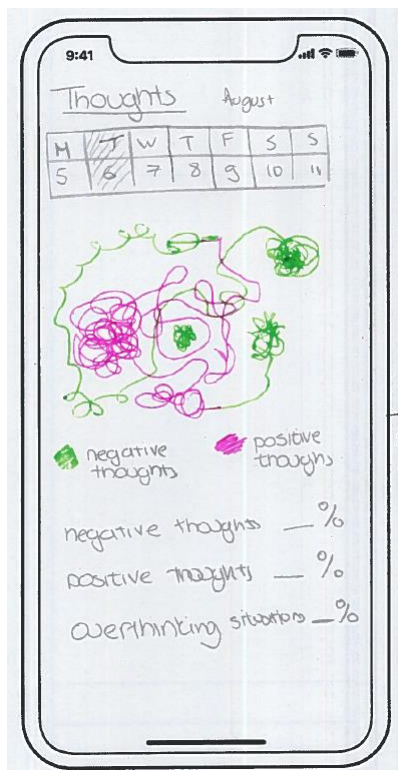
previous factors. The location points have different colors, red, green and yellow which represent high, medium and low stress levels respectively.



The Anxiety factor doesn't have a visualization; however, it has an extra graph to show the percentage of each level. It also includes the number of minutes that the user experiences any sort of anxiety during the day. For the location, similarly to the "stress" factor, different colors, red, green and yellow which mean high, medium and low anxiety levels.



The last factor is named “Thoughts”. One of the participants of the focus group, included the phrase “positive thoughts,” on her drawings which inspired this factor. This sector should reflect the needs of the user. It is separated into three categories: the first is positive thoughts, the second is negative thoughts and the last is overthinking. During the focus group the word “overthinking” was repeated a few times, therefore the users may want to get more information regarding this. During the lo-fi design there was a visualization, that included the positive and negative thoughts of the user. However, through the hi-fi design the visualization looked a bit cumbersome and was excluded. The rest of the design of this interface follows the same pattern with the previous factors. The location points have different colours, that match the colours of the graphs. Green represents positive thoughts, pink negative thoughts and orange overthinking. Next there is one graph that shows all three types of thoughts at different times of the day.



The “Guidance” interface includes four subcategories. The first is Journaling. This interface shows you previous journaling entries and encourages you to write a new one. Guidance also includes “Meditation” practices. Another subcategory is “Learn”. If you tab on this button you are greeted by articles and videos regarding mental health. The Last, subcategory is “Talk”. Talk was developed due to the focus group’s concern regarding not seeking professional help. In the “Talk” sectors, the user is given the opportunity to talk to a professional either by chat or by a phone call. It also allows the user to check their previous messages with other professionals. The very last interface was influenced by the focus group. As mentioned, the participants of the focus group would like the app to know some information about their personal environment. The questions on this interface identify some aspects of the user’s personal life that cannot be captured by sensors but can affect the mentality of the user. Acknowledging the fact that this is only a prototype, I must add that in the final app there should be more questions which should be reviewed by a professional.



5. Evaluation

After the completion of the hi-fi prototypes, it was essential to test the prototype. In order to reveal the effectiveness and efficiency of the system, and to identify potential errors and pain points, a usability testing was chosen. The design of the test was goal orientated instead of system oriented.

5.1 Participants and Setting

In total, eleven people participated in the evaluation process. According to Nielsen (2000), the ideal number of participants are five- to six people. Elaborating about this, they explain that many users are doing the same things and as a result you are not collecting new data. However, during this evaluation process five participants weren't enough. After completing the evaluation process with five people, there was no clear indication of problems because every participant gave different comments regarding the system. The results of the evaluation started to repeat after the ninth participant. Hence, the evaluation process ended with eleven participants. The participants were between the ages of fifteen and fifty-eight (Mean: 36.5). Although the majority of the participants were in their twenties. The age of the participants was taken into consideration to ensure that the participants could represent all the potential future users. The subjects were recruited via text messages and it lasted almost thirty minutes. The evaluation was completed in the cafeteria of the Exchange building at the Jubilee Campus with a laptop computer.

5.2 Procedure

The evaluation process had three phases. During the first phase the participants had to complete several tasks while being timed. The second phase includes an interview with the participant regarding their views on the system. The last phase of the testing procedure consisted completing a system usability

scale (SUS) questionnaire. The tasks form, the interview questions and the questionnaire can be found in the appendix.

5.2.1 Completing the tasks

The participants had to complete twelve tasks while being timed. The figure 6 below shows the average time that the participants needed in order to complete each task. All tasks had equal level of difficulty however some task had troubled the participants. The positive outcome is that the average time for each task is less than a minute.

The most time-consuming task was the fourth task with an average of 53.38 seconds. The question for this task was “what time you were most calm?”. Most participants had hard time locating the Time figure while other weren’t sure about what the sunrise icon meant. Three out of eleven participants gave up during this task. Many participants explained that they would prefer a regular graph for the timetable.



Figure 6: Task Time

The second most time consuming task, was the seventh task with an average of 52.90 seconds. The question for this task was “What situation started your overthinking”. Several people had issues locating the overthinking under the “thoughts” sector with enough people trying to find it under anxiety. During

this task two participants gave up. However, after taking the Thoughts hexagon they found the situation quite easily. Therefore, the issue for this task was to locate the “overthinking” sector.

The third time-consuming task, number eight has an average of 48.35 seconds. The question for this task was “What time did you get angry and why?”. Just like the previous task, the issue was understanding that anger is a mood and therefore to find information about this they needed to tab on the “Mood” sector. In addition to this, many participants couldn’t read the times on the graph because the size of the font was too small, however they could easily locate and point out where the time was. The Same issue was noted for the sixth question. According to the participants the words on the maps are too small to read. Furthermore, many participants express that this graph about time is much more understandable than the one in the “Calm” sector.

Apart from timing, other observations were made. Three participants seem to find the answers to the tasks in the “observation” section. This was particularly interesting, and once they completed the tasks, they confirmed the observation. For example, for the tenth question, “what trigger your anxiety today?” the answer could be found under “Triggering Points” which is located right above “observations”. Last, although the “Eating Habits” sector wasn’t fully implemented, a task was given for that interface. Apparently, many people thought that the graph isn’t clear, and that they didn’t understand that is “clickable”

5.2.2 Interview

After, the participants completed the tasks, they had the chance to use the system by themselves and look at any sectors they wanted or didn’t have the chance to look at during the task completion.

The first question of the interview was whether they used any similar apps before. All eleven participants had a negative response. The fact that the same question was asked during the focus group and had the same response shows that people may not be aware of their existence.

The participants also explain that the application covers all aspects of mental health, and they are happy that it combines other aspects like exercise and eating. However, one participant mentions a mobile app named “Calm”. This application is focusing on meditation, sleep stories and music with ultimate purpose of relaxing the user. According to the participant, incorporating breathing and yoga exercises to the prototype would be an excellent addition to the app.

For the next question, the participants were asked if they would like to change anything. There was a mix of answers for this question. Many people expressed that they wouldn’t change anything. Other people mention things they struggled with during the tasks. The most popular reply was changing the timetable in the “Calm” factor to a regular graph. Other replies included changing the font size on the graphs and maps and changing the “eating habits” interface as they couldn’t understand what each percentage meant. Moreover, a participant mentions that he would like to change the statistics page because there is too much information on it and it’s a bit overwhelming. Due to the fact that not everything is the same colour and the results are different for each factor (it shows levels, minutes, percentages or emojis), the interface looks messy and it’s not clear that they are clickable. Last, a few people suggested that the “back” button, should be moved on the top of the interface because it’s not usually found at the bottom.

The majority of the participants gave positive feedback. They expressed their satisfaction on the amount of information it can give and that it’s straightforward and easy to use. Furthermore, they were happy that it gives solutions to the problems it detects and shows the location and the triggering points, because it can help you avoid things that have a negative outcome in your mental health. Some people revealed that they liked that the app was separating every factor. In particular, they mentioned that is great that stress and anxiety are separated and treated differently. Another aspect they mention was that the visualizations were interesting and very helpful. Last, the participants emphasised that the function about talking to a professional makes them feel like the app has prestige. On the other hand, they also

mentioned the negative aspects of the app. Some participants were concerned about the amount of information the app is showing may stress some people. Others mentioned the tasks they had a hard time solving. One participant however mentions the lack of an overview or dashboard interface. Moving on to the next question “Do you think that this app can help you prevent mental health problems?”. A large number of participants gave a positive reply. They mention that the ability to identify what cause you a mental health related issue, can help you avoid it or decreases the attention you are giving to that aspect. One participant mention that she would love to use this app because she believes that “prevention is the best cure”. Additionally, a participant suggested the use of notifications, to notify the user when their stress or anxiety levels are high or to just tell their progress. On the contrary, only three people believe that the app cannot help prevention. They explain it depends on the user and their want to get better. Specifically, they mention that, if someone doesn’t follow the instructions and solution of the app by viewing on the app that they are in a bad state it will turn against them. Last, one participant believes that the app can’t help you prevent mental health problems but rather helps you overcome them.

Moving on to the next question “Do you think that this app can help you prevent mental health problems?”. A large number of participants gave a positive reply. They mentioned that the ability to identify what causes a mental health related issue, can help you avoid it or decreases the attention you are giving to that aspect. One participant mention that she would love to use this app because she believes that “prevention is the best cure”. Additionally, a participant suggested the use of notifications, to notify the user when their stress or anxiety levels are high or to just tell their progress. On the contrary, three people believed that the app cannot help prevention. They explained that it depends on the user and their desire to get better. Specifically, they mentioned that, if someone doesn’t follow the instructions and solution of the app by viewing on it that they are in a bad state of mind it will turn

against them. Lastly, one participant believed that the app can't help you prevent mental health problems but rather helps you overcome them.

The following questions were about their thoughts on using a mobile application to track mental health and if it bothers them that the app is collecting data like location and app usages. Before they answer this question, the participants were guaranteed that their data would be safe. The participants had similar opinions for this matter. Everyone would like to try the app, and they would trust it to an extent. People spoke briefly about the development of technology especially in medicine. One participant mentioned that she would trust it because it's more anonymous and less personal than talking about their mental health face-to-face with a professional, which many people could find appealing. Not everyone feels comfortable to visit a therapist. Although some people were concerned about the validity of the results, as a consequence they wouldn't trust it 100% and would rather visit a professional. For the second part of the question some participants weren't fond of the idea of the app tracking them 24/7 or with the fact that it collects other data from your device. However, the majority understood that it is vital for the application in order to give you solutions and explanations regarding your results. Many participants stated that there are so many other mobile apps that are already tracking them therefore they are not bothered by one more, especially since this one is trying to help them.

The last question for the interview was about the design of the app. All participants liked the design of the app, and the colourful interfaces. The participants were pleased with the images because it projects a calm and helpful environment. On the other side some participants mentioned that the design could prevent other people from using it because it can be viewed as unprofessional. Once again, they highlighted the problem with the font sizes. Moreover, one participant mentioned that the "statistics" interface is too long, and another explained that she would like the "check" and "statistics" buttons to exchange positions.

5.2.3 System Usability Scale (SUS) questionnaire

The final step for the evaluation was the SUS questionnaire, which the participants completed after the interview. The results of the SUS can be seen in the figure below. The mean is 80.23 and the median 82.50 are in the acceptable range. Also, the average of 80.23 classified the prototype as “B” which according to (Brooke, 2013) is an excellent rating.

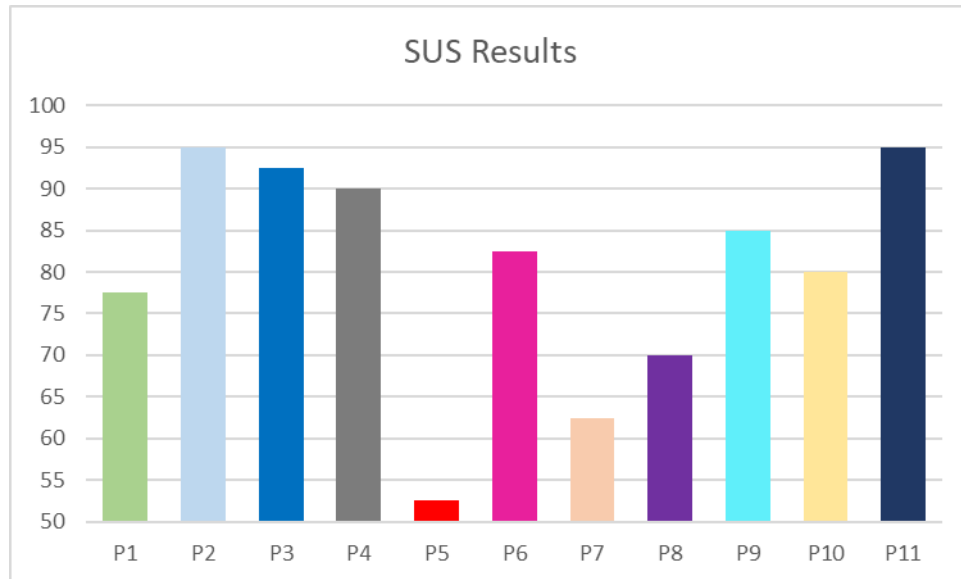


Figure 7: SUS Results

6.Conclusion

The results of the evaluation had a positive outcome and all the requirement have been met. The main issues that the participant had was the font size on the graphs and maps. However, this is just a prototype and therefore you can't zoom in and out. If the app was functional this issue would not happen. Similar explanation exists for the back button. Considering that the design is for iPhone X, the back button will not be needed. However, the evaluation happen on a computer and this functionality isn't possible. The majority of the participants would prefer if the timetable on the calm design, was a regular graph. Other participants express their opinion on changing other parts of the design. Even though they are minority; their suggestions should be taken into consideration. At the end, of the day the design should reflect what the potential users need.

In the future, the progression of this prototype would require another evaluation after all the changes happen and an implementation to a function prototype.

To conclude this project has successfully achieved all the objective and goals that were set. A literature review was developed, that cover several aspects of mobile mental health, including a research about existing similar devices. A focus group was contacted in order to identify the requirements and the design of the mobile app, is meeting all requirements. Last the prototype was tested and the problems have been addressed.

References

Andrian, A., 2012. There's an App for ThatL Information Technology Applications for Cognitive Behavioral Practitioners. *ABCT*, 35(4).

Anon., 2019. *Bankmycell*. [Online]

Available at: <https://www.bankmycell.com/blog/how-many-phones-are-in-the-world>
[Accessed 11 9 2019].

Anon., 2019. *nice.org*. [Online]

Available at: <https://www.nice.org.uk/guidance/cg123/ifp/chapter/common-mental-health-problems>
[Accessed 11 09 2019].

Anon., n.d. *Mental Health Foundation*. [Online]

Available at: <https://www.mentalhealth.org.uk/statistics/mental-health-statistics-most-common-mental-health-problems>
[Accessed 11 9 2019].

Anon., n.d. *World Health Organization*. [Online]

Available at: https://www.who.int/features/factfiles/mental_health/en/

Blanco, C. et al., 2008. Mental Health of College Students and Their Non-college attending peers:results from national epidemiologic study on Alcohol and related conditions. *Arch Gen Psychiatry*., 65(12), pp. 1429-1437.

Brooke, J., 2013. SUS: A Retrospective. *Journal of Usability Studies*, 8(2), pp. 29-40.

Brown, C. et al., 2010. Predictors of mortality in patients with serious mental illness and co-occurring type 2 diabetes. *NIH Public Access*, pp. 250-254.

Clarke, R. & Youngstein, T., 2017. Cyberattack on Britain's National Health Service —A Wake-up Call for Modern Medicine. *The new england journal of medicine*, pp. 409-411.

Dehling, T., Geo, F., Schneider, S. & Sunyaev, A., 2015. Exploring the Far Side of Mobile Health: Information Security and Privacy of Mobile Health Apps on iOS and Android. *JMIR MHEALTH AND UHEALTH*, 3(1), p. 8.

Diamant, N., 2018. *brandchannel*. [Online]

Available at: <https://www.brandchannel.com/2018/10/05/5-questions-george-eleftheriou-sentio-solutions/>
[Accessed 11 09 2019].

Division, B., 2015. *heretohelp*. [Online]

Available at: <https://www.heretohelp.bc.ca/q-and-a/whats-the-difference-between-mental-health-and-mental-illness>
[Accessed 11 9 2019].

Ellis, L. A. et al., 2013. *Young men's attitudes and behaviour in relation to mental health and technology: implications for the development of online mental health services*, s.l.: Ellis et al. BMC Psychiatry .

Farrer, L. et al., 2013. Technology-Based Interventions for Mental Health in Tertiary Students: Systematic Review. *JOURNAL OF MEDICAL INTERNET RESEARCH*, 15(5), p. 101.

feel, 2019. *feel*. [Online]
Available at: <https://www.myfeel.co/faq>
[Accessed 11 09 2019].

foundation, I. d., n.d. *Interaction design foundation*. [Online]
Available at: <https://www.interaction-design.org/literature/topics/user-centered-design>
[Accessed 11 09 2019].

Friedman, J., 2019. *yoga journal*. [Online]
Available at: <https://www.yogajournal.com/lifestyle/yj-tried-it-leaf-urban-jewelry-predicts-your-stress-level>
[Accessed 11 09 2019].

Fuhrer, R. & Keyes, K. M., 2019. Population Mental Health in the 21st Century: Time to Act. *AJPH Editorials*, pp. 152-153.

GAGGIOLI, A. & RIVA, G., 2013. From Mobile Mental Health to Mobile Wellbeing: Opportunities and Challenges. *Stud Health Technol Inform*, pp. 141-7.

George, M. J., Russell, M. A., Piontak, J. R. & Odgers, L. C., 2018. Concurrent and Subsequent Associations Between Daily Digital Technology. *Child Development*, 89(1), pp. 78-88.

Giota, K. G. & Klefara, G., 2014. Mental Health Apps: Innovations, Risks and. *E-Health Telecommunication Systems and Networks*, pp. 19-23.

Harrison, V. et al., 2011. Mobile mental health: Review of the emerging field and proof of concept study. *Journal of Mental Health*, 20(6), pp. 509-54.

Hassan, G. et al., 2016. Mental health and psychosocial wellbeing of Syrians. *Epidemiology and Psychiatric Sciences* (2016), Volume 25, pp. 129-141.

Hochman, D., 2015. *Forbes*. [Online]
[Accessed s 2019].

Hockman, D., 2015. *Forbes*. [Online]
Available at: <https://www.forbes.com/sites/davidhochman/2015/06/21/does-the-spire-stress-tracker-actually-work/#756daccd4139>
[Accessed 11 09 2019].

Jokela, T., Iivari, N., Matero, J. & Karukka, M., n.d. *The Standard of User-Centered Design and the Standard Definition of Usability: Analyzing ISO 13407 against ISO 9241-11*, s.l.: s.n.

Kathleen R. Delaney, N. S. K., 2019. Building a Child Mental Health Workforce for the 21st Century: Closing the. *Journal of Professional Nursing*, Volume 35, pp. 133-137.

Kawachi, I. & Berkman, L. F., 2001. Social Ties and Mental Health. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 78(3), pp. 458-467.

- Kenny, R., Dooley, B. & Amanda, F., 2016. Developing mental health mobile apps: Exploring adolescents' perspectives. *Health Informatics Journal*, pp. 265-275.
- Keyes, C. L., 2002. The Mental Health Continuum: From Languishing to Flourishing in Life. *Journal of Health and Social Behavior*, 43(2), pp. 207-222.
- Kilbourn, A. M. et al., 2018. Measuring and improving the quality of mental health care: a global perspective. *MEASURING AND IMPROVING THE QUALITY OF MENTAL HEALTH CARE*, pp. 30-38.
- Kitzinger, J., 1995. Qualitative Research: Introducing Focus Groups. *BMJ*, Volume 311, pp. 299-302.
- Krebs, P. & Duncan, D. T., 2015. Health App Use Among US Mobile Phone Owners: A National. *JMIR MHEALTH AND UHEALTH*, 3(4), p. e101.
- Kross, E. et al., 2013. Facebook Use Predicts Declines in Subjective Well-Being. *PLOS one*, 31 1, pp. 1-6.
- Kyeong, S., 2018. *Classification of SmartMentalTech Services and Application for Comprehensive Mental Healthcare Stepped-Care Model (CMHSCM): Health Psychological Approach*. Japan, Elsevier Ltd.
- Lazar, J., Feng, J. H. & Hockkeiser, H., 2010. *Research Methods in Human Computer Interaction*. 1st ed. Glasgow: Bell & Brain.
- Lupton, D. & Jutel, A., 2015. 'It's like having a physician in your pocket!' A critical analysis of self diagnosis smartphone apps. *Social Science & Medicine*, pp. 128-135.
- Majoe, D., Trachsel, T. K. & Gutknecht, J., 2010. *A Smart Wearable Sensor Assisting in Mental Health*, Denmark: UbiComp.
- Marley, J. & Farooq, S., 2015. Mobile telephone apps in mental health practice:. *BJPsych Bulletin*, Volume 39, pp. 288-290.
- Marzano, L. et al., 2015. The application of mHealth to mental health: opportunities and challenges. *The Lancet Psychiatry*, 2(10), pp. 942-948.
- mind.org, n.d. *mind*. [Online]
Available at: <https://www.mind.org.uk/information-support/types-of-mental-health-problems/mental-health-problems-introduction/#.XXoWOihKhEZ>
[Accessed 11 9 2019].
- Mohr, D. C., Zhang, M. & Schueller, S. M., 2017. *Personal Sensing: Understanding Mental Health Using Ubiquitous Sensors and Machine Learning*, s.l.: The Annual Review of Clinical Psychology.
- Naslund, J. A., Aschbrenner, K. A. & Bartels, S. J., 2016. Wearable devices and smartphones for activity tracking among people with serious mental illness. *Mental Health and Physical Activity*, Volume 10, pp. 10-17.
- Nielsen, J., 2000. *Nielsen Norman Group*. [Online]
Available at: <https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/>
[Accessed 11 September 2019].

- Olf, M., 2015. *Mobile mental health: a challenging research agenda*, Palo Alto: European Journal of Psychotraumatology.
- Perez, B. M., Diez, I. d. l. T. & Cononado, M. L., 2013. Mobile Health Applications for the Most Prevalent Conditions by the World Health Organization: Review and Analysis. *JOURNAL OF MEDICAL INTERNET RESEARCH*, 15(6), p. 120.
- Piwek, L., Ellis, D. A., Andrews, S. & Joison, A., 2016. The Rise of Consumer Health Wearables: Promises and Barriers. *PLoS Med*, 13(2).
- Rickwood, D. J., Deane, F. P. & Wilson, C. J., 2007. When and how do young people seek professional help for mental health problems. *MJA*, 1 10, pp. 35-39.
- Rickwood, D. J. et al., 2015. Changes in psychological distress and psychosocial functioning in young people accessing headspace centres for mental health problems. *MJA*, 1 June, pp. 238-543.
- Sama, P. R. et al., 2014. An Evaluation of Mobile Health Application Tools. *JMIR MHEALTH AND UHEALTH*, 2(2), p. 19.
- Sano, A. & Picard, R. W., 2013. *Stress Recognition using Wearable Sensors and Mobile Phones*, s.l.: IEEE computer society.
- Schnall, S. et al., 2015. A user-centered model for designing consumer mobile health (mHealth). *Journal of Biomedical Informatics*, pp. 243-251.
- Silva, B. M., Rodrigues, J. J., de la Torre Diez, I. & Coronado, M. L., 2015. Mobile-health: A review of current state in 2015. *Journal of Biomedical Informatics*, Volume 56, pp. 265-272.
- Sivan, Z., 2015. *Indiegogo*. [Online]
Available at: <https://www.indiegogo.com/projects/the-wellbe#/>
[Accessed 11 09 2019].
- Torous, J., Staples, P. & Onnela, J. P., 2015. *Realizing the Potential of Mobile Mental Health: New Methods for New Data in Psychiatry*, New York: Springer.
- usability.gov, n.d. *usability.gov*. [Online]
Available at: <https://www.usability.gov/what-and-why/user-centered-design.html>
[Accessed 11 9 2019].
- Vidal, M., Turner, J., Bulling, A. & Gellersen, H., 2012. Wearable eye tracking for mental health monitoring. *Computer Communications*.
- Wartella, E. et al., 2016. Teens, Health and Technology: A National Survey. *Media and Communication*, 4(3), pp. 13-23.
- Wilson, M. L. et al., 2018. *Mental Workload as Personal Data: Designing a Cognitive Activity Tracker*, Canada: 3rd Symposium on Computing and Mental Health.
- Zhao, J., 2006. *Can Mobile Phone Apps Influence People's Health Behavior Change? An Evidence Review*, Sydney: School of Public Health.

Appendices

Focus Group Plan

Part1:

1. What is the first thing that comes into your mind when you hear “mental health”?
(they will write it down on post it notes, according to their answers, I will add more notes such as: mood, stress, social anxiety, depression, sleep, mental workload etc.)
2. Discuss what do you think about mental health, and what other people might be thinking about it.
3. Compare physical and mental health, do you think one is more important than the other?

Part2:

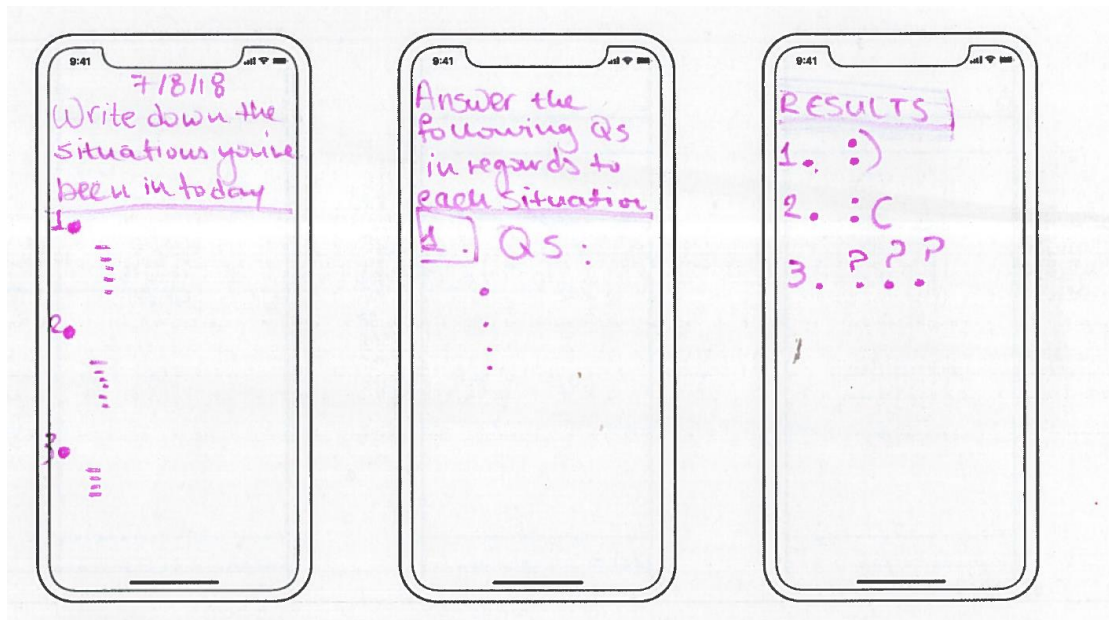
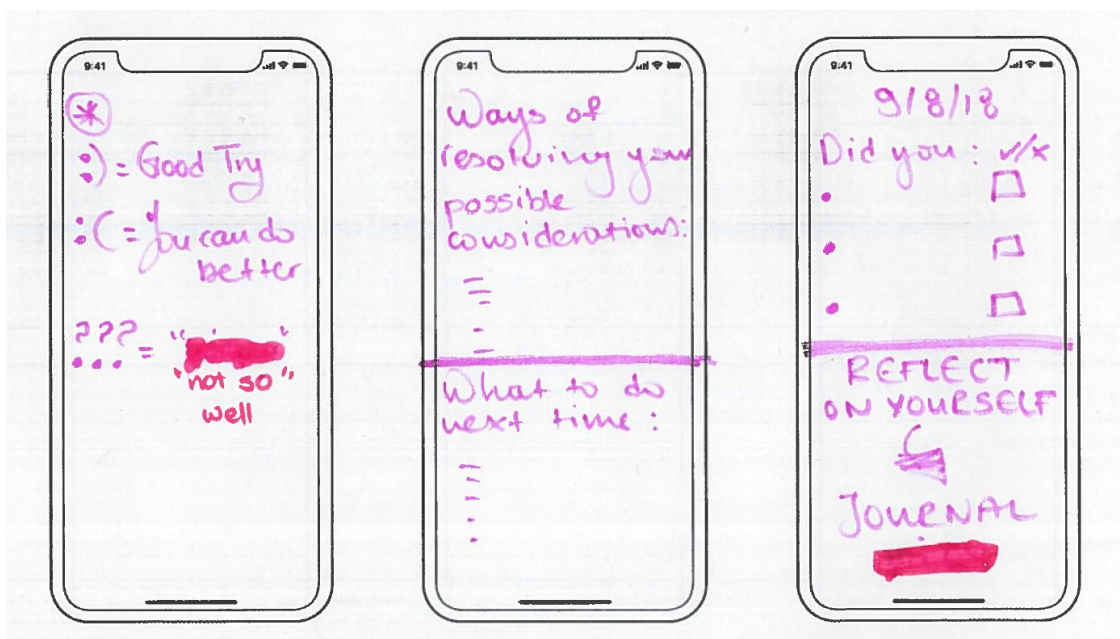
4. What would you do if you had an emotional or Mental Health problem?
5. Show examples of screen shots of mental health apps explain how they work. What are your thoughts about using a mobile app for self-monitoring mental health issues? Would you use something? Why? Have you use any similar technologies before?
6. Do you think that this kind of technology can help prevent mental health problems?

Part3:

7. Now, forget about the technological limitations. If you have a mobile application that could monitor your mental health (using a sensor) what functions would you like to have? And what things should be able to track?
8. Would you allow it to track you 24/7? Would you prefer to wear it for some short amount of time?
9. Would you allow the app to collect data from your phone? (app usage, call logs, location, camera etc)

Part4:

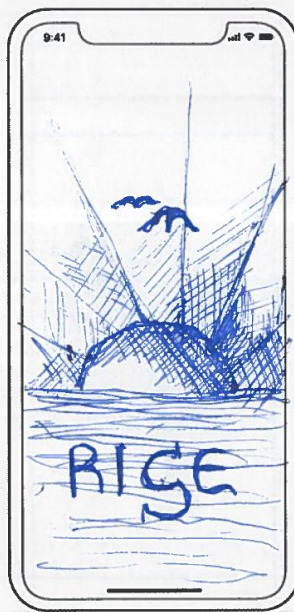
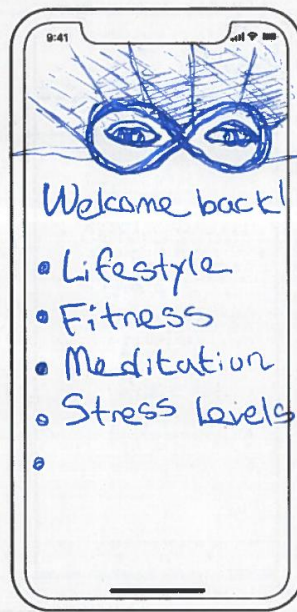
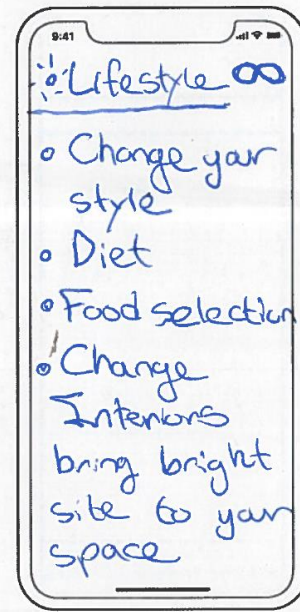
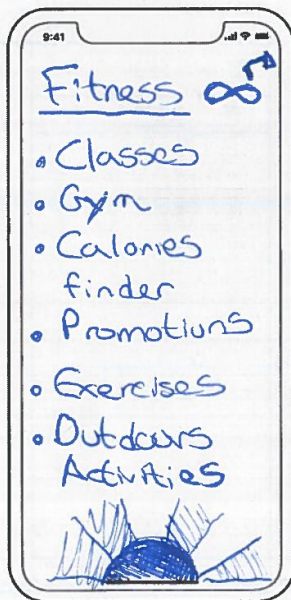
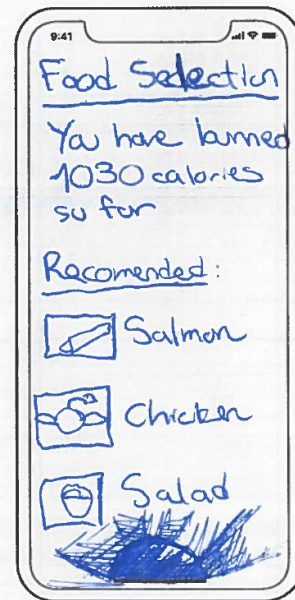
10. Focus on 1 or 2 things that the app would be able to track and draw the app’s tracking interface.



The participants drawings. Participant 2:



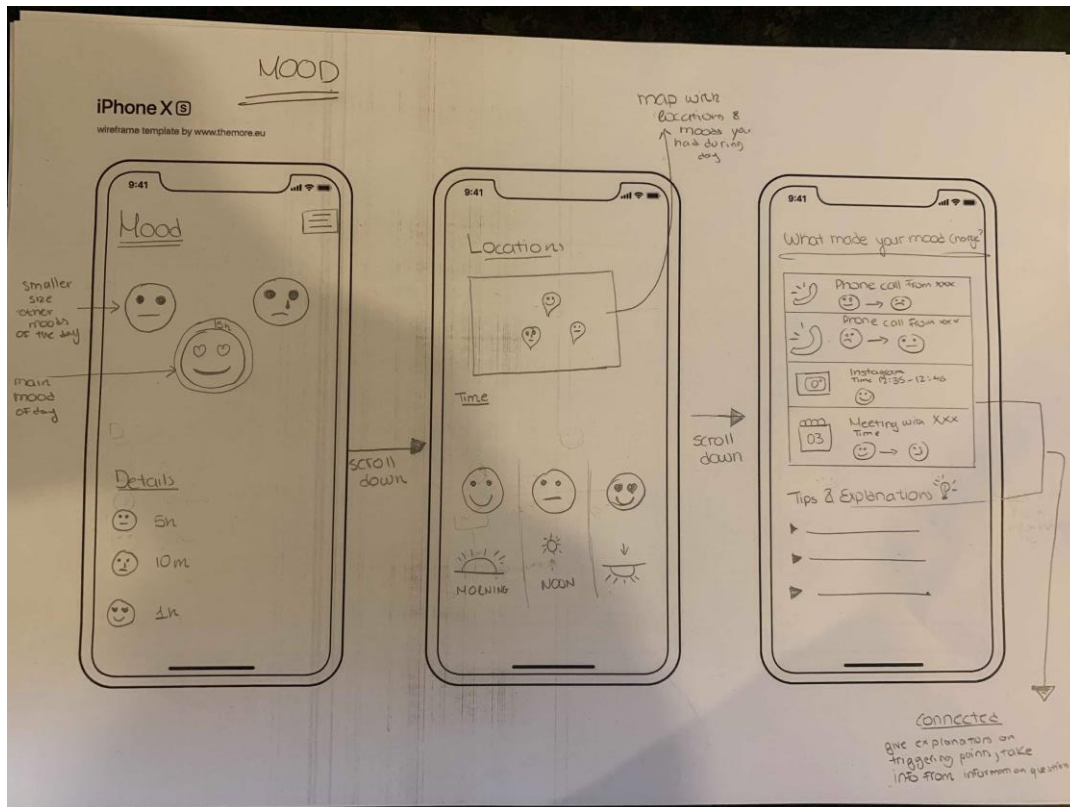
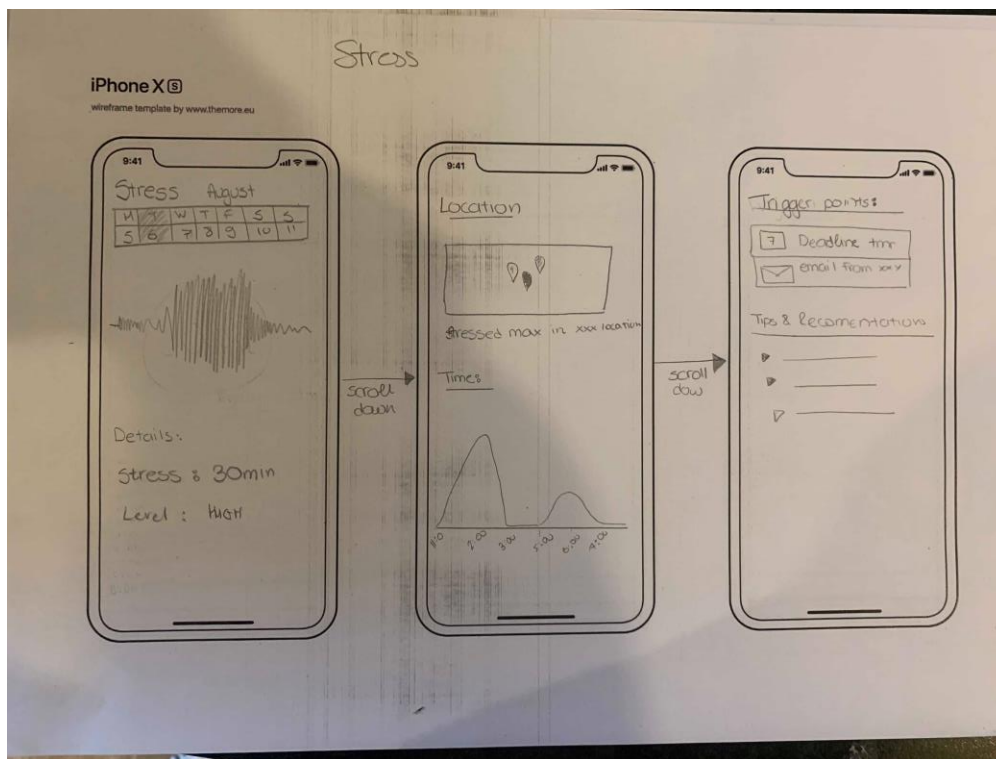
The participants drawings. Participant 3:

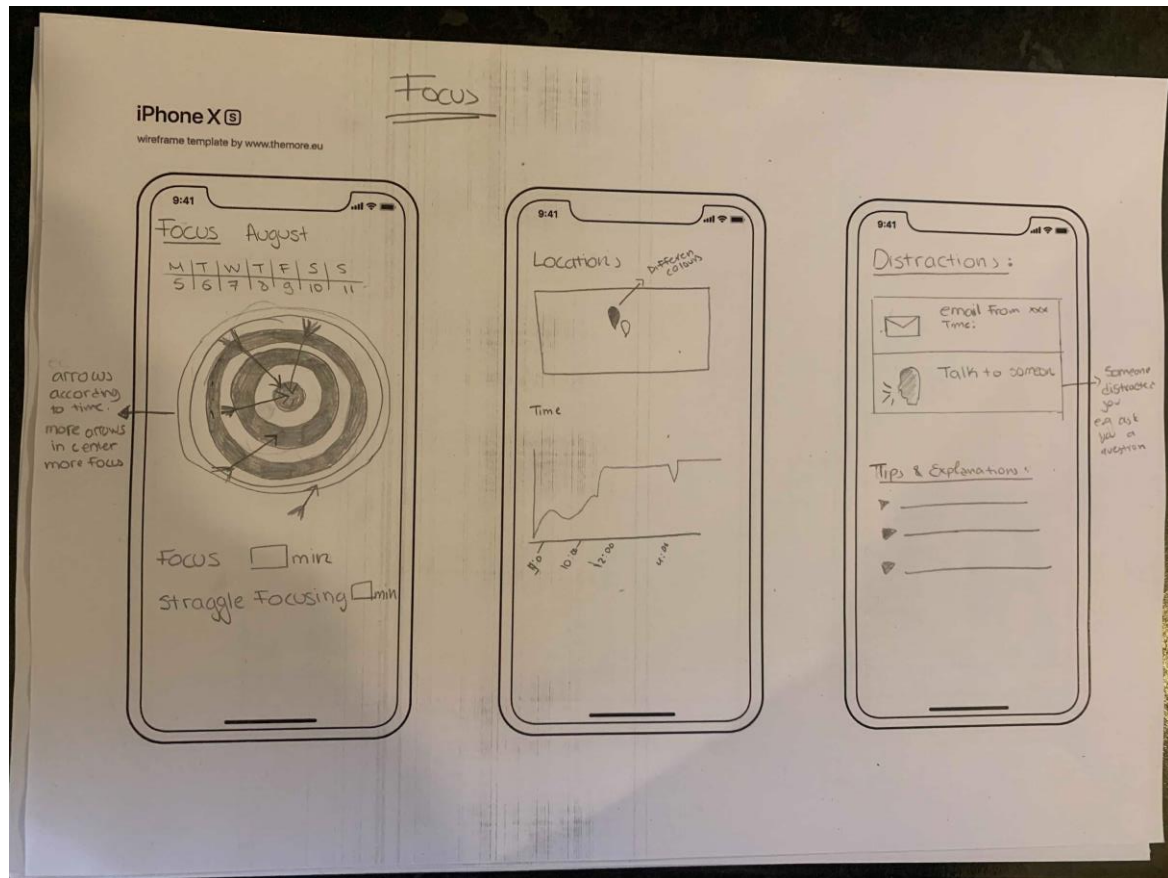


The participants drawings. Participant 4:



Lo-Fi Prototypes:





iPhone X

wireframe template by www.themore.eu

9:41

Calm August

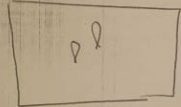
M	T	W	T	F	S	S
5	6	7	8	9	10	11



Average: — mm

9:41

Location

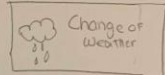


Time

%	%	%
 morning	 noon	 night

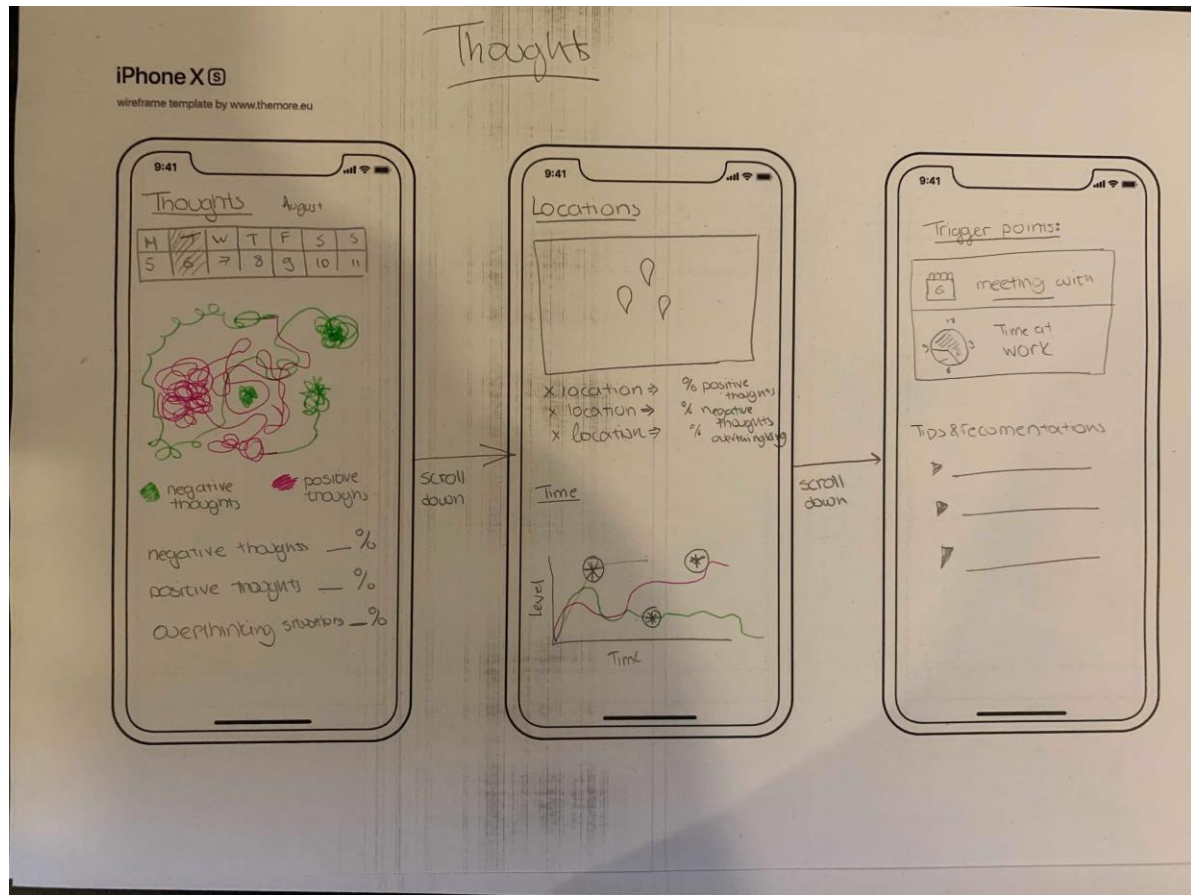
9:41

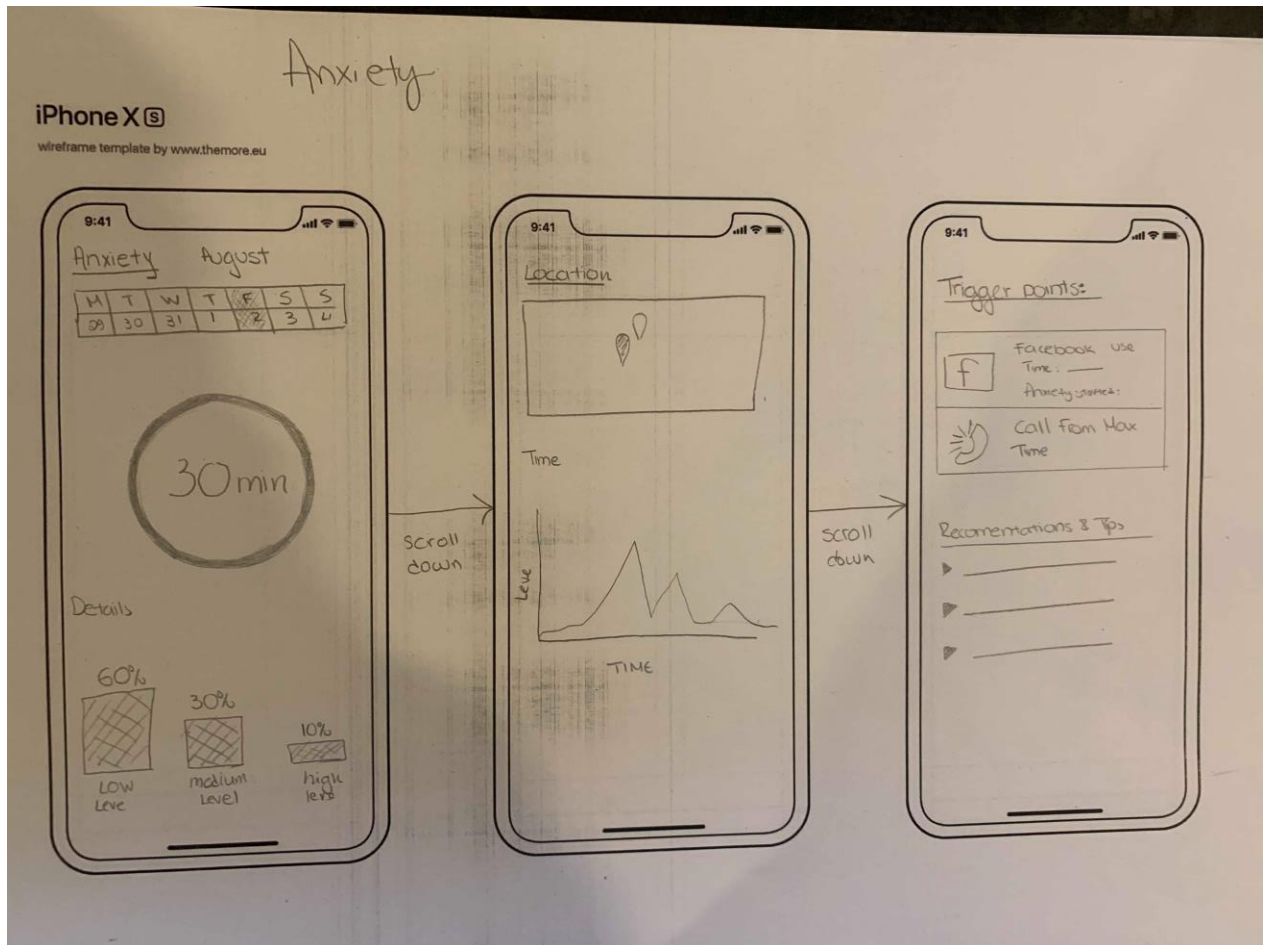
Triggering points

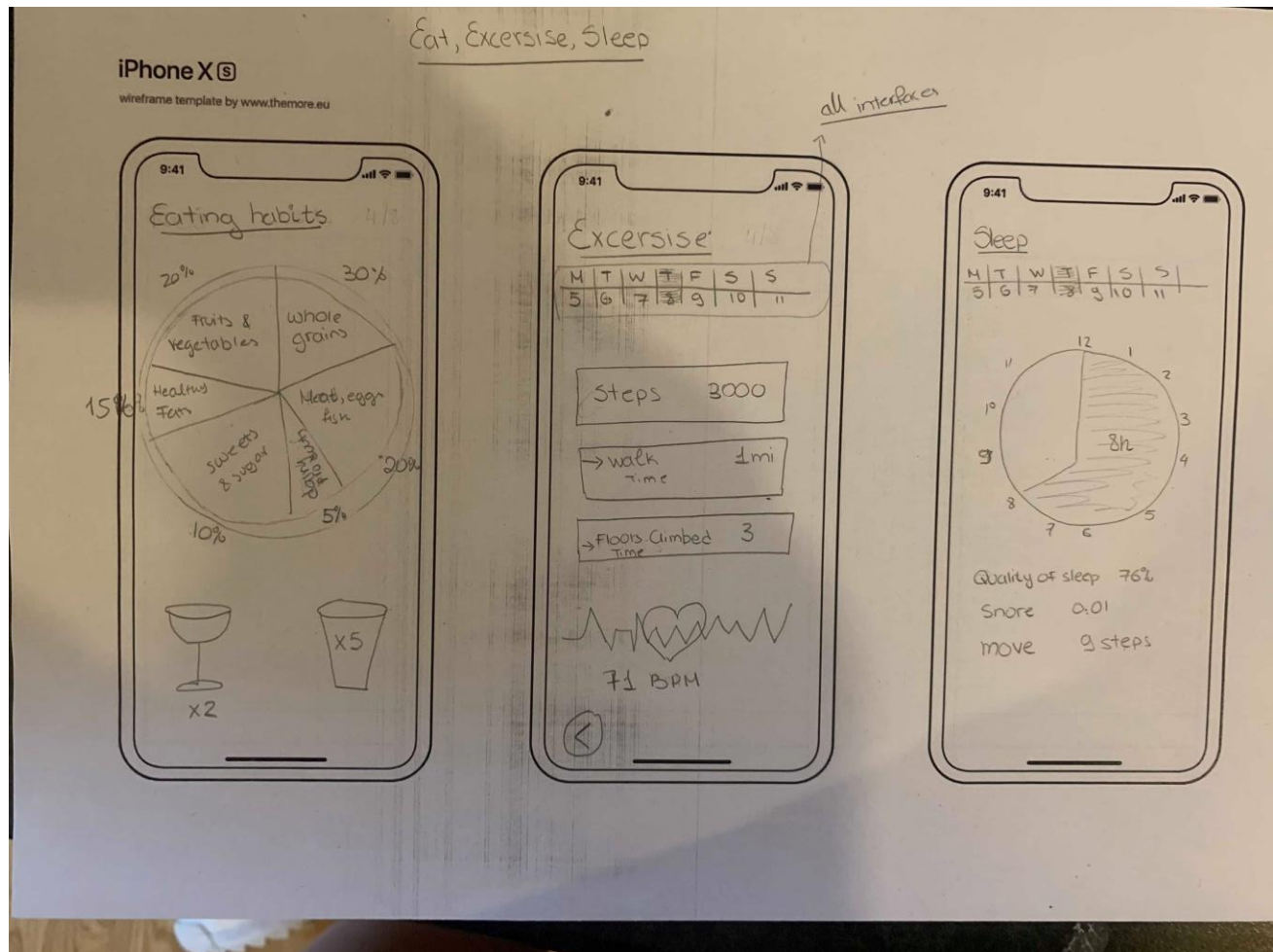


Tips & Recommendations

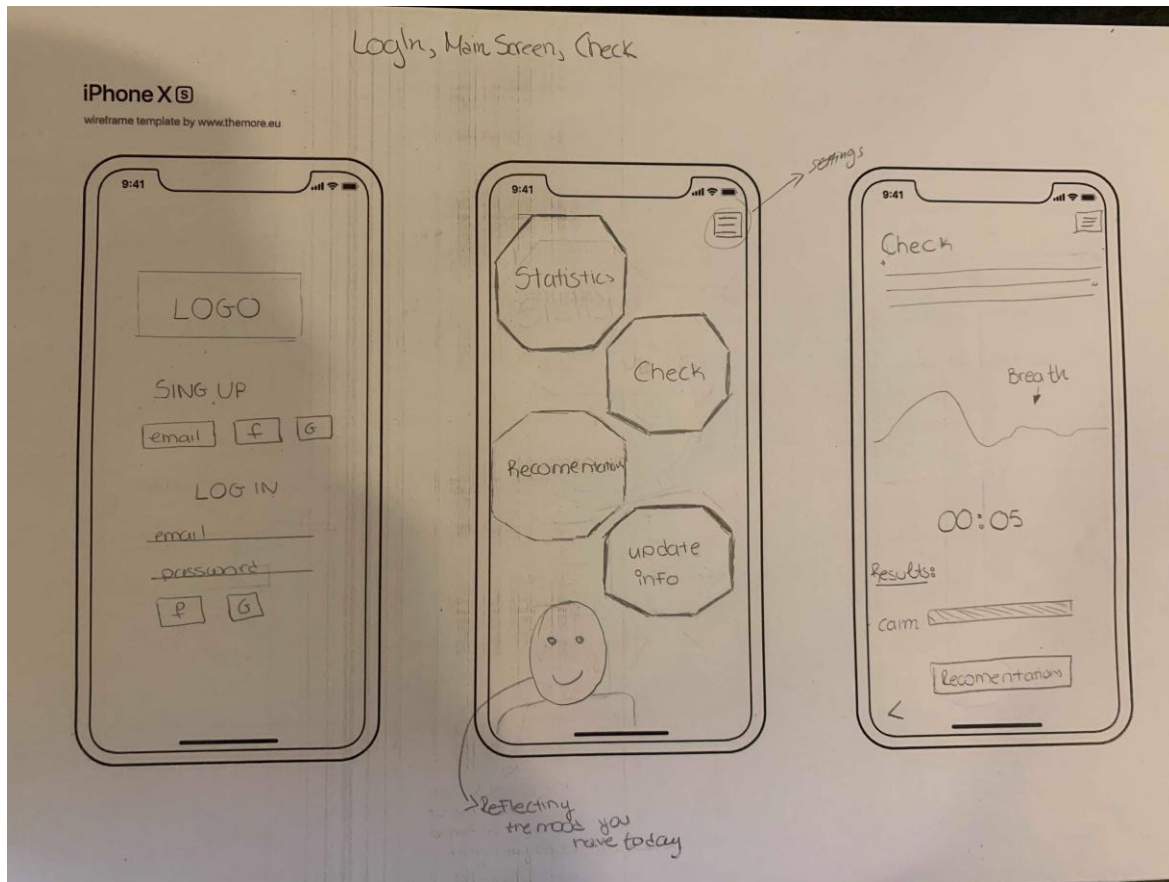
- —
- —

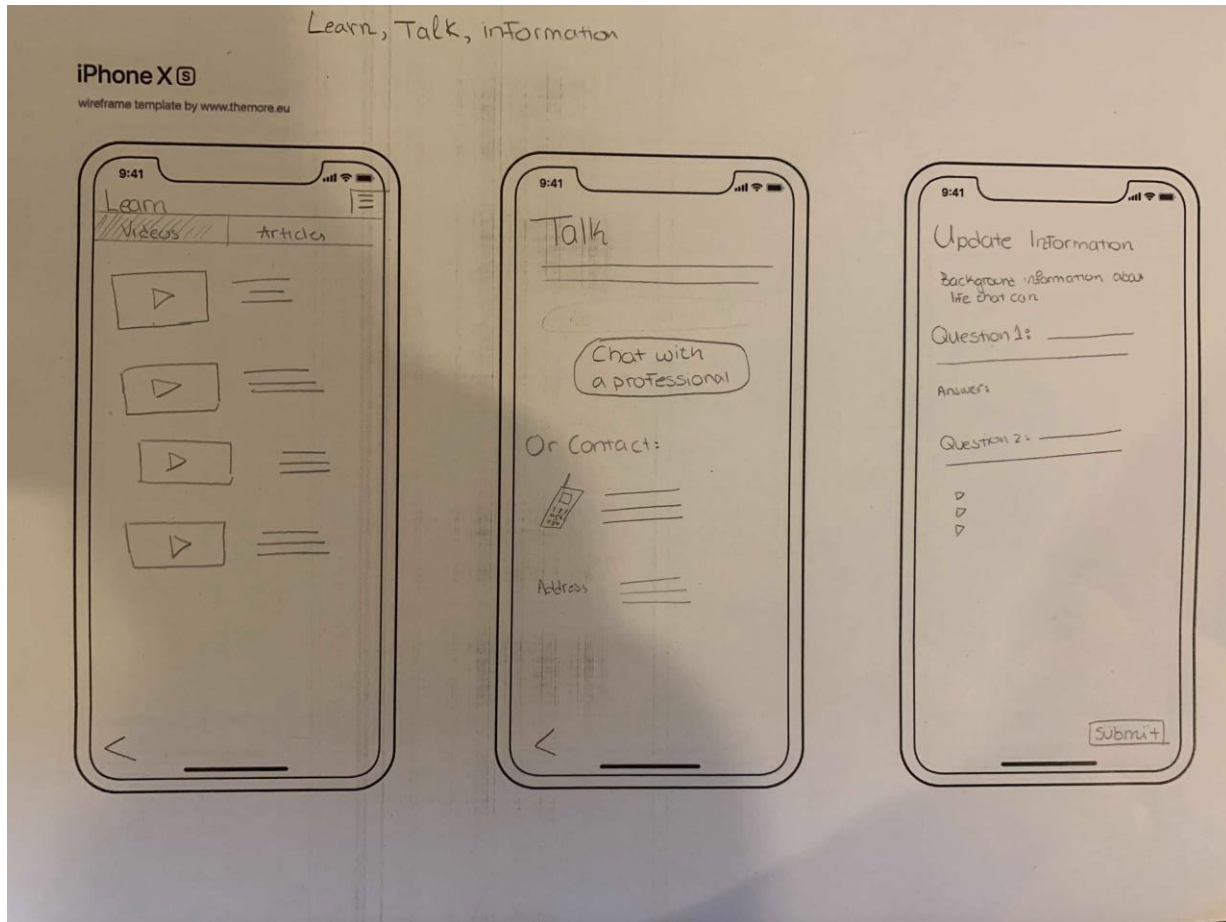




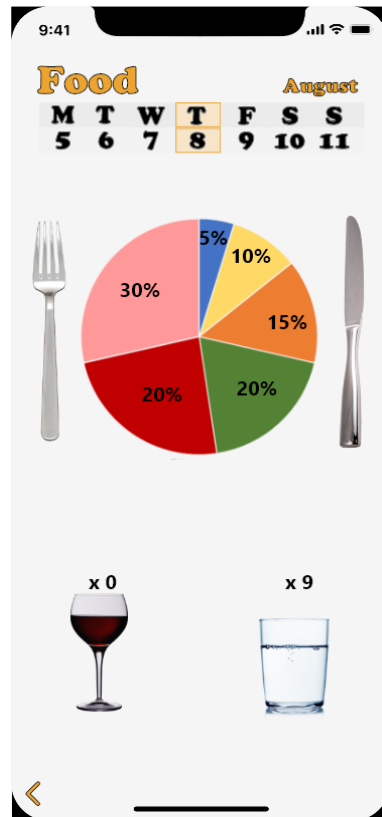
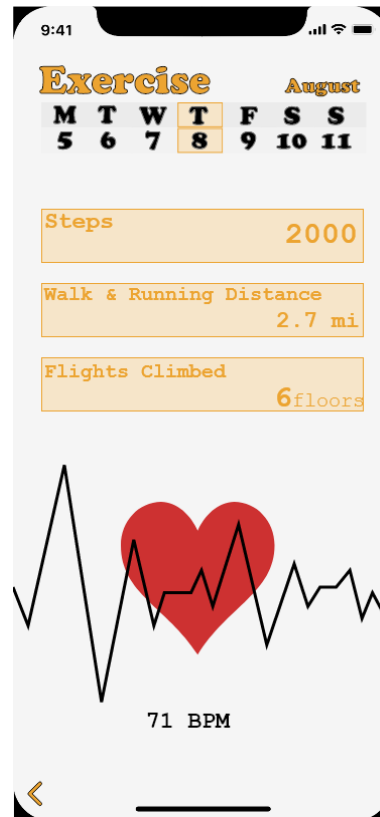
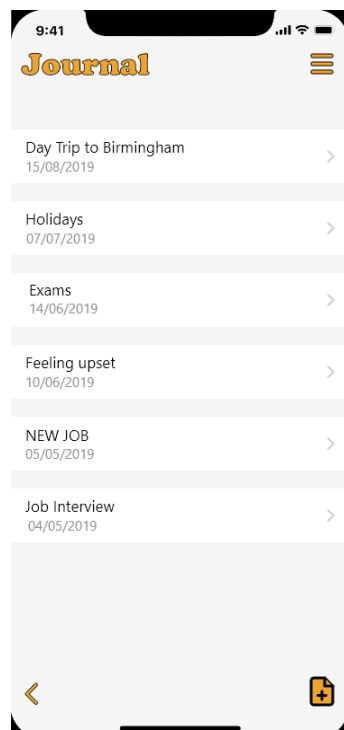
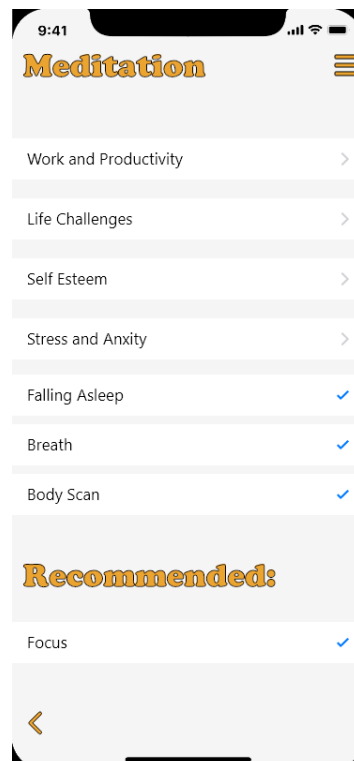








Hi-Fi Prototypes that are not included in the main text:



How to let go



Fight your fears



Why meditation is important



Tasks

No.	Question/Task	Time
1	Can you check your overall health right now? What is it? STRESSED	
2	You are stressed, what does the app recommend? Meditation or journaling	
3	Can you tell me which meditation is more appropriate today? Focus	
4	What time where you most calm? Morning	
5	What was your focus level today? low	
6	Where were you when your stress was at the highest point? Primark	
7	What situation started your overthinking? Meeting with CEO	
8	What times did you got angry today and why? 11:00/weather 13:00/phone call	
9	Can you check your eating habits today? What does the green 20% represent? Fruit and vegetable	
10	Tell me what trigger your anxiety today? Phone call by Sam and Instagram	
11	Imagine that Sam gave you bad news about something in your personal life that can affect your mental health. What should you do? Update life questions	

12	Go back to the main menu. You are overwhelmed about something and you want to talk to a professional. What should you do?	
----	---	--

Interview

1. Have you ever used any similar app before?
2. Do you think that it covers all aspects of mental health? If not, what feature would you like to see? (forget the limitations of today's technology)
3. Would you like to change anything?
4. Which was the best and which was the worst part of using this app?
5. Do you think that this kind of app can help prevent mental health problems?
6. Would you trust an app to track your mental health? Why?
7. This app is tracking you 24/7 and collects data like location, app usage etc. Does this bother you?
8. Do you have any comments about the design of the app?

