Prototyping of a Persuasive Mental Health Mobile App for University Students

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ABSTRACT

The alarming increase in the number of mental health apps in the industry underscores the growing importance of accessible and effective tools for promoting well-being and psychological health. Some individuals must download several apps to help with their mental health. In this report, we designed a mental health app with all the features combined from different apps, in such a manner that the user can only download one app and benefit from it. In this article I did an evaluation with 6 participants, both experts and everyday users. I did Usability Heuristic evaluation and got feedback from experts.

This article also describes all the features that app has briefly and how it is related to User centered design.

INTRODUCTION

A mental health app is important and useful in our day-to-day life. Considering that students go through a lot of mental health issues such as stress, anxiety and depression that affect the student's health, academic achievement, and quality of life, mental health should be taken more seriously. Since therapists can be expensive for university students, mental health apps can be convenient given that it's free of charge. University students go through a lot more mental health issues especially the international students who left their home behind for academic purposes living by themselves. Especially during COVID, the rate of anxiety and depression among college and university students had increased substantially [6]. In this project I set out to prototype a mental health app that would help promote mental health and wellbeing among university students.

In the first document of this project [1], we explain mostly about the persuasive technology that is used in mental health applications. Promoting awareness and social support for mental health can be increased by using persuasive technology [5]. Persuasive technology is defined as the use of interactive technology that is designed to change attitudes or behaviors of the users through persuasion and social influence [16]. We also introduced cognitive behavior therapy later in this article. Cognitive behavioral therapy (CBT) is a form of psychological treatment that has been effective for mental health problems such as depression, anxiety, and other mental illness [17]. CBT plays a huge part in improving mental health. There are several applications that exist for different types of mental health issues. One of the examples would be "Headspace" that helps with mindfulness, sleep, and stress [7].

A mental health app for university students should be free of charge since many can't afford to pay for an online app. It should be suitable for any age since there are some mental health apps out there that aren't suitable for children under the age of 13 [15]. When developing a mental health app, we need to consider many factors, like what the app should focus on and what is the age group that the app is built for. A mental health app is designed for people who want to improve their lifestyles or are willing to recover from their addictions. A mental health app is for users who are willing to improve their lifestyles in the long run and not someone with chronic mental health issues. People with extremely bad mental health issues or anxiety that cannot be improved with an app or is life threatening are required to seek a therapist or doctors immediately.

RELATED WORK

Many studies were conducted whether mental health app is good or bad, or if mental health app helps the user or how does it benefit the user in any way. I have used several research papers and based on that; mental health does benefit the user.

For example, one of the papers talks about how games would improve mental health and well-being in an app [4]. I have included some gaming features in the app.

One of the articles by Pooja Chandrashekar [9] shows the analysis and evidence that mental health apps did benefit a lot

of users. In the article, the efficiency of smartphone-based treatments for three psychological disorders with high 12-month global prevalence rates: depression, anxiety, and schizophrenia were performed.

Some of the other research paper that was related to this report are:

Persuasive Systems Designs: Key Issues, Process Model, and System Features:

This paper is written by Harri Oinas-Kukkonen and Marja Harjumaa, both from the University of Oulu located in Finland.

This article discusses the process of developing and evaluating persuasive systems as well as describing what kind of content and software functionality may be found in the final product. The framework suggested in this article, the Persuasive Systems Design (PSD) model, is based upon our empirical work and conceptual analysis as well as another research. This article explains some steps towards postulates behind persuasive systems.

Increasing Mental Health Care Access with Persuasive Technology for Social Good:

This article was written by Tine Kolenik and Matjaž Gams.

The article mostly describes the problems and solutions that come with using PT. First is the "Cost", where PT is seen as an advantage since it can be free of cost (just the server cost) and is affordable to most patients whereas an actual therapist might be expensive and not a lot of people can afford that. Second is the "Availability". PT is available 24/7 and its availability can be subcategorized into three, location-based availability, time-based availability, and cost-based availability. Using PT for mental health sometimes might be a better solution since you don't always have to wait and use complementary with the chosen mental health professional. Third is the "Stigma", where most people feel safer using PT as they think they won't be judged and having a more private channel for disclosing their feelings, thoughts, and issues in general.

Using PT also has its disadvantages especially for the elderly, the lowest socio-economic class, and culturally specific groups. For the elderly it can be a bit difficult for them to incorporate technology into their lives. Technology adoption due to cultural differences is crucially important as well when considering how to advance equality.

Persuasive Technology Acceptance Model and the Moderating Effect of Culture:

This article was written by Kiemute Oyibo and Julita Vassileva.

The article introduces the fitness app and health app and explains how it can be useful and advantages for these applications. Fitness applications became very popular since they help keep track of the activities such as how many calories burned, or how many steps you take and keeping track of your heart rate. It basically talks about how to make these health applications more effective in motivating behavior change, designs equipped with persuasive features such as Goal setting, Self-Monitoring, Rewards, etc. Some users might be attracted by the application's persuasive usability and some with the perceived aesthetics. Here it compares and argues that perceived persuasive adaptation will be a better option for the users and the UX design attributes.

Gamification in Apps and Technologies for Improving Mental Health and Well-Being: Systematic Review:

This article mainly describes how gamification in apps would benefit the users for their mental health and well-being.

This study aimed to analyze current applications of gamification for mental health and well-being by answering 3 research questions (RQs). RQ1: Which gamification elements are most applied to apps and technologies for improving mental health and well-being? RQ2: Which mental health and well-being domains are most targeted by these gamified apps and technologies? RQ3: What reasons do researchers give for applying gamification to these apps and technologies?

This paper analyzes that gamification is widely applied to a great range of mental health applications that improves health and well-being.

METHOD

In this section, we describe how we provide more rational explanation on how we carry out the experiment and how keeping the app consistent based on the users' need. The app is designed based on usability heuristic guidelines that would serve the user with the right information, guidance, and support to meet their needs and goals in a personalized and effective manner.

Research was conducted based on the Nielsen 10 Usability Heuristics for User Interface Design, and among those, a few of the Usability Heuristics were used to provide feedback to the application.

Let's begin by providing a short summary of what each of the Heuristic features are:

Visibility of System Status: Keep users informed about what's happening through clear feedback and indicators. Avoid leaving them guessing about system responses.

Match Between System and Real World: Use language and concepts familiar to users. Design the interface to reflect how users think and speak about the tasks.

User Control and Freedom: Provide easy ways for users to undo actions and exit unwanted states. Let them navigate and explore without feeling trapped.

Consistency and Standards: Follow established conventions, patterns, and guidelines to create a coherent and predictable user experience.

Error Prevention: Design interfaces to minimize the occurrence of errors by offering clear instructions and confirmation steps.

Recognition Rather Than Recall: Make information, options, and actions visible to users, reducing the need for them to remember details.

Flexibility and Efficiency of Use: Cater to both novice and expert users by providing shortcuts, accelerators, and customizable interfaces.

Aesthetic and Minimalist Design: Present information and functionality in a simple, uncluttered manner. Use visual hierarchy to guide user attention.

Help Users Recognize, Diagnose, and Recover from Errors: Offer descriptive error messages, suggest solutions, and guide users to rectify errors.

Help and Documentation: Provide easily accessible help resources, but ensure the system is intuitive enough that users rarely need to consult documentation.

Now that we have seen the 10 Usability Heuristics, I will be demonstrating research by asking a few participants to perform number of tasks, for which they will identify the Heuristics principles that is violated and the severity level using the table and the codebook below figure 3 and figure 4.

Table A1: Nielsen's Heuristic Codes

Heuristic Code	Explanation
[H2 - 1]	Visibility of system status.
[H2 - 2]	Match between system and real world.
[H2 - 3]	User control and freedom.
[H2 - 4]	Consistency and standards.
[H2 - 5]	Error prevention.
[H2 - 6]	Recognition rather than recall.
[H2 - 7]	Flexibility and efficiency of use.
[H2 - 8]	Aesthetic and minimalist design.
[H2 - 9]	Help users recognize, diagnose, recover from errors.
[H2 - 10]	Help and documentation.

Figure 3: Shows the Nielsen's Heuristic Code. [Table A1]

Table A2: Severity Ratings

Severity Rating	Explanation
0	Usability catastrophe; imperative to fix.
1	Major usability problem; important to fix.
2	Minor usability problem.
3	Cosmetic problem.
4	Don't agree that this is a usability problem.

Figure 4: Shows Severity Ratings. [Table A2]

Participants

Our research is based on a mobile app interface. Two tables were provided above about Nielsen's Heuristic code and the Severity ratings.

I recruited in total 6 participants to evaluate the prototype using figure 3 and figure 4 and based on their experience using Mental health app. The participants provided feedback on the app's interface and prototype that is shown in the Procedure section of this Methodology.

The participants I chose are all University students, except one who is an experienced user (Professor of York University). All the university students are between the ages 24 years – 28 years old. Some of them are psychology students who have knowledge towards cognitive behavior and some of them are computer science students, who have experience with UI UX designs.

The first half of the participants (Labeled as P1 participants) were asked to provide feedback on the app I designed based on the heuristic behavior. This batch of participants are experimental group.

The second half of the participants are more like general participants who were exposed to other mental health apps

and provided opinions based on using other mental health apps. Using this criticism, I improved or used their criticism to design my mental health app.

The participants I chose are all non-paid volunteers who have some experience using mental health apps and or have knowledge of Cognitive Behavior Therapy (CBT).

Apparatus

This project was designed entirely using Figma. Aside from Figma, other software such as notepads or Miro were used for jotting down points or ideas or sketching basic designs.

Figma is mostly used for UI UX designing and wireframing. Figma is a great tool for prototyping or designing any app or website. It is easy to collaborate with other team members or organize ideas together using Figma. Figma has its own framework for mobile interface or desktop interface. Using Figma, users can work remotely and brainstorm together using FigJam.

Using Figma we can design and create any type of app. Even though there are many other prototyping tools, I find Figma much easier than other UI/UX designing tools. Besides, Figma also has the option to collaborate with others and work on a project together at the same time.

Procedure

This section elaborates on what the participants did and how the experiment went. There are two batch of participants as described in the "Participants" section, P1 and P2 participants.

Let's begin with P1 participants who are the experimental group and were exposed to my mental health app designing prototype. The table below, figure 9, shows the result of the feedback provided. The participants were asked to perform some tasks where they were to identify the Heuristic principle and how it is violated using the severity level table in figure 4 and the codebook in figure 3.

The first feedback was on how my Sign Up and Log In page violated the Usability Heuristic 6 (Recognition rather than recall) and 8 (Aesthetic and minimalist design).

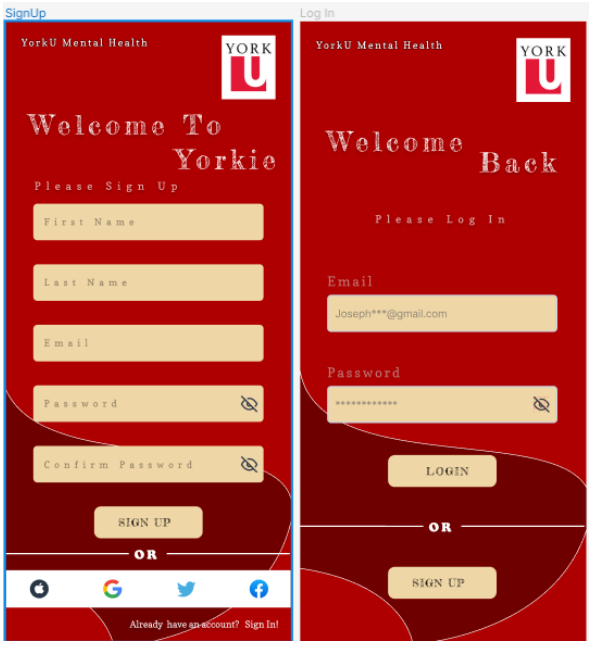

Figure 7: Screenshot showing before theme changed.

Figure 8: After shot of theme changed.

Figures 7 and 8 show both the before and after aesthetic design and changing the fonts making it consistent.

ID	Problem	Heuristic Code	Severity Rating
1	You may want to change the theme for the LogIn and SignUp page. Pick a lighter color or a calmer color that would make it easier to read the contents of the page	[H2-8]	1
2	Change the background color for the input label boxes and make the fonts more visible for the user to read and understand. You may want to make the fonts consistent.	[H2-6]	2
3	Create a warning message for the user when they want to Log Out.	[H2-9]	1

Figure 9: Feedback by the assessors.

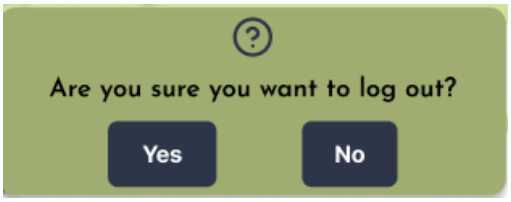

Figure 10: Shows the Log Out warning for the user.

Figure 9 shows the feedback provided by the 3 assessors using both the Heuristic codes and severity ratings from Figure 3(Table A1) and figure 4(Table A2). Here figure 10 shows the warning alert that the user receives while trying to log out from the app.

Now, coming back to P2 participants, they were asked the question “What would you like to see in a mental health app, and would you use such an app?”. They provided several criticisms and out of those I decided to pick some of the important ones.

The first participant demanded that a mental health app should be free for students, or it should have only a one-time fee, that’s very low. She also said an app should have support services. I implemented a section under the settings in the app, labeled as “App Tutorial”, where it will give the tutorial on how to use the app and all the other features. It falls under the Usability heuristics “**Help and Documentation**”.

The second participant was criticizing how there are some apps that don’t listen to the individual’s problem. There should be a feature where the individual can share their problems and the app would be able to suggest the individual with their solution and what features in the app would help them with their mental issue.

In the app I implemented a feature daily thought, where the user would be talking to an AI and basically the feature (AI) would be talking to the user giving tips or listening to the user and or suggesting what feature will help the user within the app.

The third participant mentioned how to have access to therapists. Sure, an app would be helpful when it comes to stress, anxiety, and depression, but if the situation gets worse, they might need to see an actual therapist. She was stating that finding a therapist online can be stressful and difficult, so if there was a feature in the app that would help to find therapist, would be helpful. There is a whole page that I implemented on finding a therapist based on the user’s need.

The application was designed based on the participants’ criticisms and feedback.

Design

The app interface was designed using Figma with the frame provided by Figma, that is iPhone 14 Pro Max, 430 x 932.

RESULTS

I used System Usability Scale (SUS) to evaluate my prototype. The System Usability Scale (SUS) is a simple questionnaire with 10 questions that helps measure how user-friendly a product or system is. Users rate their agreement with statements using a scale from "Strongly Disagree" to "Strongly Agree." The scores are then converted into a usability score between 0 and 100. Higher scores mean better usability. It's a quick way to get an idea of how easy a product is to use and where improvements might be needed [26].

I asked 5 participants to volunteer to test my design implementation based on the 10 questions given by SUS scale in the figure below, figure 11.

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

Figure 11: System Usability Scale [26]

Figure 12 and figure 13 below show the results of the participants score between 0 to 100 percent and the score on each question received by the participants.

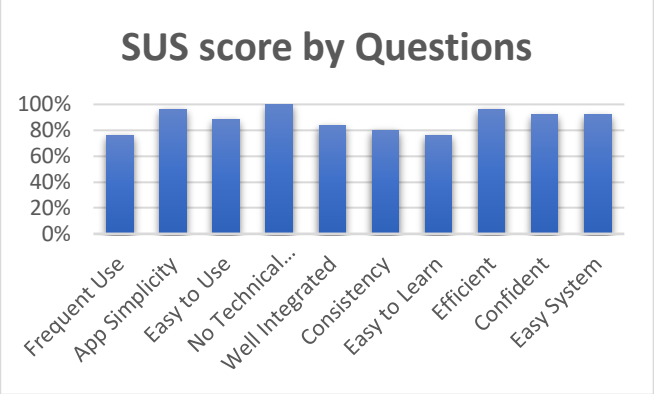

Figure 12: Shows score on each question by participants.

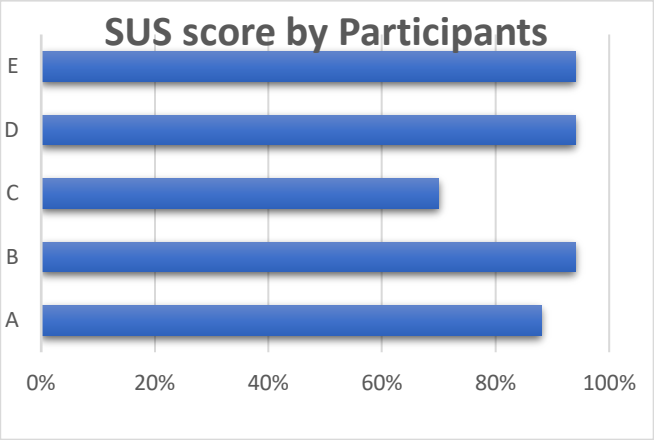

Figure 13: Shows score by participants.

DISCUSSION

In this section, we provide a brief overview of what features would be in the mental health application and how would it benefit the user in terms of cognitive behavior or using persuasive technology. This section is described in terms of technical milestones, rationale for the approach and expected intellectual contribution.

Now, what is User-Centered Design? User-centered design (UCD) is an iterative design process in which designers focus on the users and their needs in each phase of the design process. In UCD, design teams involve users throughout the design process via a variety of research and design techniques, to create highly usable and accessible products for them [23].

While designing the mental health app, I had hand on experience with other health apps such as Headspace, Wysa, and Calm and using their reviews and feedbacks from the app, I designed and implemented an app with certain features that those high ended app has and or lacks some other feature that the user wants.

We are building a mental health app to help students at university or school with their mental health. The most important objective that will attract a user to use the mental health app would be the interface of the application.

Cognitive behavior (CBT) is important when it comes to mental health application. Based on one of the articles the concept of cognitive consistency can be leveraged in persuasive design by presenting information that is inconsistent with a user's thinking, causing an inconsistency between attitudes and behavior and potentially leading to attitude change [1].

There are several ways cognitive behavioral techniques can be used in a mental health application. These techniques or exercises help users recognize and replace negative thought patterns with more positive and constructive thinking. I have implemented several features that incorporate CBT principles.

REGISTRATION:

Below are the login details needed for the user to create an account and sign in.

Sign Up: The user needs to sign up first to create an account with their "First name", "Last name", "email", and "password".

Login: After signing in, the user needs to log in with their "email" and "password".

Screenshot of the Sign In page and Login page prototype is shown in Appendix B, figure a and figure b.

HOMEPAGE FEATURES:

Below are the features that the individual could find on their homepage. Ten different features were implemented in this app. Starting with Daily Activities. Daily Activities are to be performed by the user to help the individual grow positive mindset and build confidence.

Daily Activities

Daily Thoughts: These daily thoughts would allow the user to write what's in their mind and what made them trigger any bad energy or write down their both positive and negative thoughts. It guides the individual through a structured process of identifying the situation, recording their automatic thoughts, and then analyzing the evidence for and against those thoughts. It helps users reframe their negative thinking patterns into more realistic and positive perspectives.

Here, the AI would also suggest the user tips, or which feature in the app would help them.

Daily Goals and Challenges: The user can set goals related to their mental well-being. For example, they can set a goal of waking up early at a certain time, or burning a certain number of calories, etc. The app would also provide the user with reminders and progress tracking to help them stay motivated. This feature also lets the user set up challenges for themselves.

Next comes the feature that would benefit the user to be fit and healthy.

Exercising

Exercises and Relaxation: This feature would help the user with various relaxation techniques, such as several breathing exercises, stretching your body, and any other exercises that would help the individual to manage stress and promote a sense of calm and relaxation.

Apart from relaxation, it presents other exercises that help to burn calories, such as cardio and muscle exercises. The app also provides videos of daily simple exercises that would help the individual to stay fit and healthy.

Workouts: This includes video and exercises for fitness enthusiasts. Since exercises and workout are proven to cure mental health problems [24].

Mindfulness and Serene

Meditations: This feature is like relaxation exercise but more like meditating to help with stress and anxiety and to calm yourself. It would also help with insomnia and ADHD. This feature uses deep breathing exercises, body scan meditation, visualization meditation and meditation to improve concentration.

Sleep casts (sleep focused meditation): This would help the individual with sleeping schedule. The app would play some lullaby or music for the individual to fall asleep. If the individual is going through insomnia, this feature would help the user fix their sleep cycle. Insomnia is very common among university students, hence this feature in the app would be extremely useful [12].

Podcasts: There can be podcasts about how one individual can reduce their stress and anxiety or learn more about valuable insights and knowledge.

Entertainment

Games: Almost every app has pop ups for mini games, or many individuals download diminutive games on their device to de-stress themselves or while they are bored. Why not have mini games in our app that would also help the user de-stress themselves while they are at work or need a break from their busy life [4].

Support System

Therapists: This tool would let the user explore the therapist they would like to assign themselves to. It would show a list of therapists that the user can work with online or via phone including their ratings.

Community Support: The app would allow a user to connect with other users sharing their thoughts on a similar journey and form a community. Users can share experiences, provide support, and exchange tips and advice, creating a sense of belonging and encouragement. This can be an open free therapy session for the individual.

Tracker

Mood tracker: Users can record their daily mood in the app using emoji [14]. Hence if the individual is keeping track of their daily mood, they would know what triggered them for negative emotions. Emojis are used to track their daily mood, including happy, sad, normal, excited, and angry emoji.

These are some of the features that I combined together in order for the individual benefit from downloading only one application.

FUTURE WORK

An app should be always updating as new generation comes and we get new ideas depending on how the app would benefit the user. A few of the future implementations that I plan to do are:

Progress Tracking: Users can track their progress over time using charts and graphs. This feature enables individuals to visualize their improvement and identify areas that require further attention. An example would be a smart watch tracking your steps or how many calories you burnt. This certain feature wasn't designed in the app, but I would like to implement this feature in the future.

Inspiring quotes: The app would send the user inspiring quotes or positive thoughts, to let the user have a more positive mind.

AD Tracking: Tracking feature would be very important to the individual who is going through any addiction and trying to get rid of their addiction. This would tell the user how much time has passed since they started fighting their bad habit or their addiction. This is another type of persuasive technique that would help the user to keep track of their break from addictions.

Notifications: The app sends reminders to users to engage in various activities, such as completing Daily thoughts, practicing relaxation techniques, or reviewing their goals. This ensures consistent engagement and helps individuals integrate cognitive behavioral techniques into their daily routines.

Furthermore, I plan to implement security in this app. This app would be very cautious about data protection since it would contain the user's personal information regarding their mental health that the user wouldn't want to be leaked or shared. This app would contain safeguards that would help with securing the users data [14].

Lastly, in the future, I would like to implement this app by taking the high fidelity and converting to coding and develop it so that students would be able to download it and use it free of cost.

CONCLUSION

In this article, we implemented a mental health app that would help university students with their stress, anxiety, and cure depression. This app also has other features that would help the individual to stay fit and healthy apart from mental health therapy. I tried to design an app capturing ideas from several different mental health apps to build one with all the features that the user demands.

Although I have a long way to go building this app into a perfect mental health app, I would like to invest more time and develop this mental health app so that the students could benefit from it. Especially the international students who go through a lot leaving behind their home.

ACKNOWLEDGMENT

This section is optional. You can thank people or funding agencies who helped with the research.

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APPENDIX A: ALL THE PROTOTYPES

Account Access and Registration

Figure a

Figure b

Figure c

All Features

Figure d

Figure e

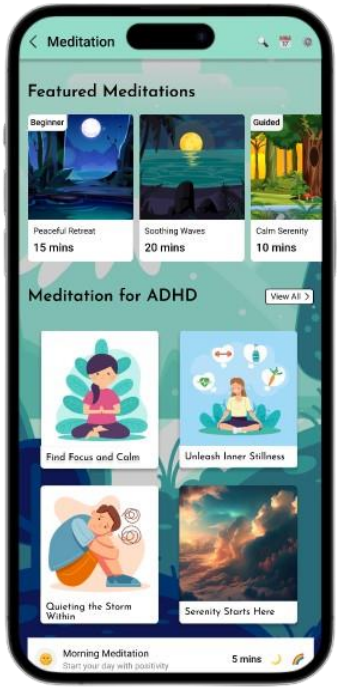

Figure 1

Figure g

Figure h

Figure i

Figure j

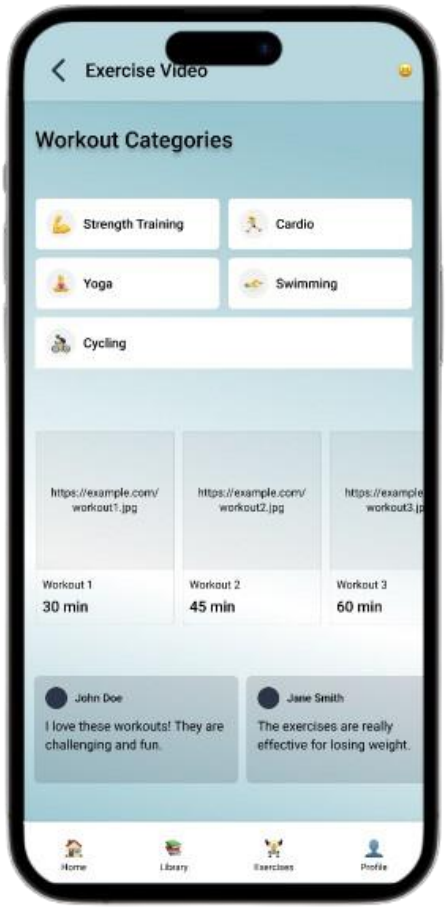

Figure k

Figure 2

Figure 3

APPENDIX B

Usability Heuristic

#1. Visibility of System Status

"The design should always keep users informed about what is going on, through appropriate feedback within a reasonable amount of time [18]".

This heuristic is important when it comes to mental health apps. A user should be able to know its progress status and updates about their tasks and how far much did they achieve.

Notifying the user or sending them simple reminders about appointments or progress updates can be encouraging to the user and it would help the user to be engaged with their mental health goals.

Therefore, we do implement the design where the user would be notified about their progress status.

#2. Match between system and the real world

"The design should speak the users' language. Use words, phrases, and concepts familiar to the user, rather than internal jargon. Follow real-world conventions, making information appear in a natural and logical order. [18]"

This heuristic can be a nuisance to some users if the app is designed in a way that would make it difficult for the individual to use it. While designing an app, the UX/UI designer would think about how comfortable the user should feel using the app. The app should use simple languages, terminology, and explanations that the user is familiar with.

#3. User control and freedom

"Users often perform actions by mistake. They need a clearly marked "emergency exit" to leave the unwanted action without having to go through an extended process. [18]"

Control and freedom are what attracts the user. An app should have a **back** and an **exit** button. They should be able to adjust settings, choosing themes, and personalize content to ensure the user feels safe and has a sense of ownership and agency over their mental health journey.

#4. Consistency and standards

"Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform and industry conventions. [18]"

This one is like the second heuristics except in more details. This heuristic explains that while designing an app, the app needs to make sense to the user and the user would know what to expect from such navigation tool, or clickable texts or icons. It's not that all applications must look the same, but the individual would know what to expect and not wander around in confusion [19].

Consistency in visual design elements such as color schemes, icons and texts are very important. For example, for the search button, sticking to the standard magnifying glass would be finest since the users would recognize it easily [19].

#5. Error prevention & Help users recognize, diagnose, and recover from errors:

"Good error messages are important, but the best designs carefully prevent problems from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action. [18]"

"Error messages should be expressed in plain language (no error codes), precisely indicate the problem, and constructively suggest a solution. [18]"

Error prevention has similar features to "User control and freedom" except with more safety features for the user. Error prevention is an important heuristic when it comes to banking apps or any medical device design. But when it's about mental health app, this can be used as a warning pop-up for the user, when the user is attempting to delete their account or when the individual is trying to restart a task by mistake.

The error message should also be visible and written in bold, highlighted that would catch the attention of the user to prevent any mistake.

#6. Recognition rather than recall:

This heuristic talks about how a user shouldn't have to remember information about interfaces. It talks about how information required to use the design, for example, "field labels or menu items" should be visible to the user for them to understand instantly and not remember them.

#7. Flexibility and efficiency of use:

The interface should be usable to both novice users and experts. For example, shortcuts may speed up the interaction for the expert user so that the design can cater to both inexperienced and experienced users allowing users to tailor frequent actions.

#8. Aesthetic and minimalist design:

"Aesthetically pleasing designs can provide memorable experiences that differentiate a brand. However, interfaces should only include necessary elements, with high informational value. Clarity will always win over visual flourish."

An interface should be pleasing to the user and especially while designing mental health app, the design or the color scheme for the interface should be calm and pleasing for the user to have a memorable experience.

#9. Help users recognize, diagnose, and recover from errors:

"Design effective error messages by ensuring they are highly visible, provide constructive communication, and respect user effort."

An example would be every time the user tends to log out of an app or wants to delete certain data from the app, the app should warn the user or ask the user if they want to do it, or it was a mistake.

#10. Help and Documentation:

"It's best if the system doesn't need any additional explanation. However, it may be necessary to provide documentation to help users understand how to complete their tasks. [18]"

As we have seen in many websites and in any software applications, there is a separate button or clickable text for support, FAQs and troubleshooting option. Even if the app is designed in the perfect way, there still should be a feature for support and help or FAQs where the user is free to look for any help with the app and get any tips on how to use a specific feature in the app.