Thrive: A Mobile Cognitive-Behavioral Therapy App for Depression

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I. Introduction

A. Background of the Study

Cognitive Behavioral Therapy (CBT) is a type of psychotherapy where thought patterns are modified to change moods and behaviors. It is based on the idea that current distorted beliefs or thoughts lead to negative actions or feelings [1]. CBT has been demonstrated to improve problems such as depression, anxiety disorders, alcohol and drug use problems, marital problems, eating disorders, and severe mental illness. Many studies suggest that CBT is effective, or more effective than, other forms of psychological therapies [2].

A lot of people, especially at this time, are using their mobile phones. Given the widespread use of smartphones, mobile and wireless technologies for health objectives can be used to improve the quality of health received and increase treatment accessibility globally [3]. According to Chandrashekar [4], mobile applications are a good choice for psychological treatment delivery due to ease of habit, low effort expectancy, and high hedonic motivation.

Mobile CBT has been proven an effective treatment for several mental health disorders, including depression [5]. Those aimed to treat depression displayed positive results. Although many mobile CBT apps are available, only a few of them have been subjected to research on their efficacy and usability.

B. Statement of the Problem

University students are reported to be displaying signs of depression and anxiety in many regions of the world. Puyat, Gastardo-Conaco, Natividad, and Banal [6] described about 1 of 10 Filipino young adults experience moderate to severe depression.

CBT has long been used to treat depression and has been proven effective. Mobile app implementation of CBT will be helpful to these students to deal with their depression. But most CBT techniques like cognitive restructuring, behavioral strategies, and mindful meditation do not come in a single application.

C. Significance of the Study

The application to be developed can help people with depression by helping them identify thought patterns, identify and challenge faulty thinking, explore, re-frame, and restructure causes of faulty thinking, motivate them to complete tasks even when feeling low, and calm themselves and focus on physical relaxation.

Implementing CBT into a mobile application made for people with depression can help them find new ways to behave by changing their thought patterns. It will be convenient to include different CBT techniques in a single application so that users do not need to download multiple applications.

D. Objectives

The aim of the study is to design, develop, and test a mobile app that uses CBT to help with depression. To achieve the goal, the study will have a number specific of objectives:

- provide a framework for cognitive restructuring to help identify and challenge faulty thinking through journaling and then explore, re-frame, and restructure its causes;
- provide a framework for behavioral strategies to help individuals set and achieve concrete, measurable goals related to their well-being;
- calm the users using guided mindfulness meditation; and
- test the finished application's usability and efficacy through surveys.

E. Scope and Limitations of the Study

The application is meant to be run on android devices. The application covers specific techniques in CBT including cognitive restructuring, behavioral strategies, and meditation. The application is aimed towards university students with depression, diagnosed or not.

II. Review of Related Literature

A. Cognitive-Behavioral Therapy

Depression, anxiety disorders, alcohol and drug abuse, marital issues, eating disorders, and serious mental disease have all been shown to benefit from cognitive behavioral therapy (CBT). According to APA [2] CBT has been shown to have a considerable impact on a person's functioning and quality of life, according to several studies.

CBT emphasizes the importance of empowering patients to take control of their own treatment. Patients/clients are assisted in developing coping skills via both in-session and "homework" tasks. When it comes to Cognitive Behavioral Therapy (CBT), the psychologist and patient/client collaborate to devise a treatment plan.

Presented to the Faculty of the Institute of Computer Science, University of the Philippines Los Baños in partial fulfillment of the requirements for the Degree of Bachelor of Science in Computer Science

Additionally, CBT may help people cope with stress, difficult relationships, grief, and other life challenges. CBT works on the premise that how we think and interpret events affects how we act and feel. It has been shown time and time again.

In CBT, the person is actively involved in a problem-solving process. In it, they discuss their current concerns. It is also time-limited, so participants know when to expect a course to conclude. A course usually consists of 20 one-on-one sessions. It might be solo or group.

CBT is a client-therapist-team-based treatment. Some psychotherapies look backwards to understand the present. But CBT concentrates on now.

CBT can help with many issues involving beliefs and ideas. Perspective-shifting is emphasized. CBT views thinking patterns as a pair of glasses that allow us to see the world in specific ways. CBT teaches us how our ideas affect our surroundings and behaviors. Changing biases and misconceptions may help people perceive things differently. CBT aims to alter negative thinking and behavior. Depression, for example, impairs perceptions. A distorted vision may lead to negative thinking, impulsive judgments, misunderstanding situations, and seeing everything as either good or bad. Fearful or gloomy thoughts may become habitual. Questions are asked and compared to reality in CBT. Suffering is reduced if a person can change their attitude and behavior to benefit themselves and others. Developing new skills facilitates productive problem solving [7].

B. Mobile Health

The term ”mobile health” relates to the practice of medicine and public health in the context of mobile devices. When it comes to health information distribution, gathering, and access, mHealth encompasses the use of mobile devices. Emerging fast, it plays a critical role in the evolution of healthcare. According to Roncero et.al [8] it is just a matter of time until mobile health applications have the ability to fundamentally alter our understanding of medicine. Patients will be able to access their health information, have brief consultations for certain conditions without contacting a physician, and find emergency assistance using these applications. In addition, they will aid in the monitoring of chronic patients, improve the safety of medicine administration, and provide a conduit for connecting with others in a similar position. Moreover, mobile devices are owned by a whopping 66.53 percent of the global population (cell phone, tablet or cellular enabled IoT device). Over 5.13 billion individuals throughout the globe owned a mobile phone in August 2019, according to GSMA real-time intelligence data. Patients are increasingly turning to telemedicine as a means of receiving medical care through mobile health applications. Tracking patients' conditions and alerting clinicians when the patient's biological data is putting them at danger is a huge step forward in healthcare management. As a matter of fact, recording and monitoring such data would be difficult or impossible without the use of mobile devices and mobile health technologies. If someone is having trouble remembering when to take or renew their medicines, there are hundreds of applications that can help them out. Medical professionals may see all of a patient's prescription drugs and their pick-up and refill history with Cureatr Meds 360. In order to better coordinate a patient's treatment, the platform makes it simple to view the whole picture of their health history, including where they've been, who has treated them, and for what [9].

Communication between patients and healthcare providers is progressively being improved via the use of mobile applications. Vernet [10] believes that smartphones seem to be the most popular gadget among doctors, according to recent surveys. In addition, the usage of these technologies by the general populace has increased significantly. As a result, consumers are at danger because of an increase in unsupervised usage. In order to ensure the quality of government-approved health applications, the federal government has launched a number of measures. Examples include ”Appsalut” and ”Regulation of Software as a Medical Device,” both of which focus on app usability. This serious issue has also been addressed by clinicians and researchers. A number of other methods have been proposed for evaluating mobile health applications, each with its own set of quality standards. There are both good and bad aspects to each of these approaches. In the app development and quality evaluation process, there is no single set of criteria that can be utilized by all stakeholders.

C. Similar Apps

While it could also help with depression, anxiety, and other mood disorders, the *Mind Journal: Diary, Mood tracker, and Gratitude* app was developed by Bazimo for journaling, graphing, reporting, and managing symptoms related to bipolar disorder. The app allows the user to experience mindfulness journaling that lets the user unwind, provides guided reflection wherein it improves mindfulness and teaches gratitude to the user, enables the user to track their daily mood dynamics, provides a self-analysis that encourages the user to a new way of thinking to avoid depression and lastly provides the user with an analysis on the trend of their bipolar schedules.

Mood Tracker. Mental Health is an application developed by Reflexio Team to provide users facing mental problems with a mood tracker and self-care journal app that provides daily questions regarding the user's health, relationships, emotions, etc. to create a brief analysis on the status and possible solutions to overcome their mental instability. The app showcases daily interaction techniques in order to provide a more in depth and immersive experience to the user in order to create a more accurate analysis on how to help the user and provide steps in order to avoid any complications on the relationships of the user.

CBT Thought Diary – Mood Tracker , Journal and Record is a Cognitive Behavioral Therapy tool developed by Inquiry Health LLC that is designed to make its users feel less stressed, anxious, frustrated, and unmotivated. The main feature of this application is its way of learning to recognize negative and distorted thought patterns in order to change your emotions and behaviors for the better. The app allows the user to document their negative emotions and provides it with its respective solution/re-evaluation to lessen or balance out the

user's mental health. That being said, the application can also keep track of the user's daily emotion and create positive daily quotes for the user depending on their mood

III. Materials and Methods

A. Development System

The application will be developed using the React Native framework on a computer running Ubuntu 22.04.3 LTS. The application will be tested on Samsung Galaxy J7 Prime. The system specification of the device is as follows: Android version 10, 3GB RAM, 1.6GHz octa-core, and 16GB ROM.

React Native is an open-source UI software framework created by Meta Platforms, Inc. It allows users to build natively rendered mobile apps for Android and iOS. The study will rely on the recommendations on React Native Documentation.

Android Studio will be used to generate an APK. Building the app requires a Keystore that developers can easily make in Android Studio.

B. Application Assets

Icons will be taken from the default icons provided by *NativeBase*, a component library, and from a free icon pack by Leonid Tsvetkov available in Figma. The artist who made the free assets to be used in the app will be cited in the credits.

C. Application Features

1) Cognitive Restructuring: This helps individuals recognize and challenge irrational or negative thought patterns and beliefs. By identifying and reframing these thoughts, people can change their emotional responses and behavior. There will be four (4) boxes to be filled up: situation, negative thought, evidence against negative thought, alternative/reframed thought.

(a) Situation
In this section, the user will describe the specific situation or problem they are facing. It sets the context for the cognitive restructuring and behavioral strategies they'll be applying. Identifying and clarifying the situation helps them focus their efforts on a particular issue, making it easier to apply CBT techniques effectively.

(b) Negative Thought
This is for the negative or unhelpful thought related to the situation. This thought typically reflects the automatic, irrational beliefs about the problem. Identifying the negative thought is the first step in challenging and changing it.

(c) Evidence Against Negative Thought
This is for the list of evidence or facts that challenge the validity of the negative thought. This helps objectively evaluate whether the thought is accurate or distorted. It encourages users to examine the evidence for and against the negative thought, promoting a more balanced perspective.

(d) Reframed/Alternative thought
The user then replaces the negative thought with a more balanced and realistic one. This reframed thought should provide a more constructive and less distressing perspective on the situation. It helps them adopt a healthier and more adaptive way of thinking, reducing emotional distress and promoting problem-solving.

2) Behavioral Strategies: CBT encourages individuals to engage in activities or behaviors that are consistent with their goals and values. This often involves setting achievable goals and gradually exposing oneself to feared or avoided situations (exposure therapy) to reduce anxiety or phobias. There will be five (5) boxes to be filled up: goals, task breakdown, exposure/desensitization plan, rewards, and relaxation techniques.

(a) Goal(s)
The user lists specific, achievable goals related to the situation. Goals should be concrete and measurable, providing direction for your actions. Clearly defined goals give you a sense of purpose and help you stay focused on what you want to achieve.

(b) Task Breakdown
The user breaks down each goal into smaller, manageable tasks or steps. This makes it easier to tackle the larger goals and prevents feeling overwhelmed. Breaking tasks into smaller parts increases the likelihood of successful completion and prevents procrastination.

(c) Exposure/Desensitization Plan
If applicable, the user outlines how they'll gradually face their anxiety or fear. User can then start with less anxiety-provoking situations and work the way up to more challenging ones. Exposure helps reduce anxiety or fear through gradual, controlled exposure to the feared situations or tasks.

(d) Rewards
The user lists rewards or treats they'll give themselves for achieving goals/tasks. These rewards serve as motivation and reinforce positive behaviors. Positive reinforcement encourages you to stay on track and maintain your motivation while working toward your goals.

(e) Relaxation Techniques
The user can note relaxation techniques they plan to use to manage stress and anxiety, such as deep breathing or progressive muscle relaxation. Relaxation techniques can help reduce emotional distress, improve focus, and enhance overall well-being while addressing anxiety or stress-related issues.

3) Mindfulness Meditation: The mindful meditation will have two main features: breathing exercises and mindfulness meditation. This will be available in-app so users don't have to use another app to look for meditation excercises, in case they want to use relaxation techniques in their behavioral strategies. Users may also opt to use other meditation excercises not available in-app.

(a) Breathing Exercises
In this part, it is intended to promote effective and healthy breathing and breath control. Breathing techniques by Paige Fowler on WebMD will be used. Credits will be given and can be found on the settings page.

(b) Mindfulness Meditation
Mindfulness is a type of meditation in which you focus on

being intensely aware of what you're sensing and feeling in the moment, without interpretation or judgment. Mindfulness and meditation exercises from the University of Melbourne Counseling and Psychological Services will be used.

4) Progress Tracking: Users can monitor their progress over time, including changes in mood, thoughts, and behaviors. This feature provides valuable insights for both users and mental health professionals.

(a) Emotional Intensity
The intensity of the emotions related to the situation before and after applying the CBT will be compared. The intensity of emotions per situation will be displayed as a bar graph.

(b) Thought Patterns
After completing the tasks for a specific situation, users will be asked to identify how they feel and what their thoughts are related to the situation after completing the tasks. This can give insight to the changes in thought patterns.

(c) Task Completion
Users can monitor their progress in completing smaller tasks or goals outlined per situation (under Task Breakdown). The percentage of tasks completed will be shown.

(d) Streaks
Users can see how much they are using the app in consecutive days. It is considered that the app is used when a new entry is added or updated, a task is completed, or the user used the meditation exercises available in-app. The app will show their longest streak and the current streak.

5) Resource Library: The app includes a list of helplines for mental health support in the Philippines. Text/call-based, chat-based, and online services are included to provide different accessibility for the university students.

D. Consultation with Professionals

The final application will be assessed by licensed professionals from UPLB Office of Counseling and Guidance (OCG). The app will not be distributed until the OCG approves the app and makes sure it will not cause any harm to the users.

E. Usability and Efficacy Testing

A total of 30 university students will use and test the app for 4 weeks. The apk will be sent to the students for testing.

The primary outcome measure, BDI-II, will be used to assess depression severity by measuring characteristic attitudes and symptoms of depression at baseline and post-intervention after 4 weeks of use.

System Usability Scale (SUS) will be used for the usability testing. It measures the participants' subjective perception of the app's usability. Users will be prompted to answer the test after four weeks of use.

For the statistical analysis, paired t-tests will be conducted to compare pre- and post-intervention scores on the BDI-II test to see if there is a significant difference between the results before and after using the app. Descriptive statistics will be used to analyze the SUS score to evaluate the usability of the app.

F. Initial Results

Fig. 1. Journals Screen

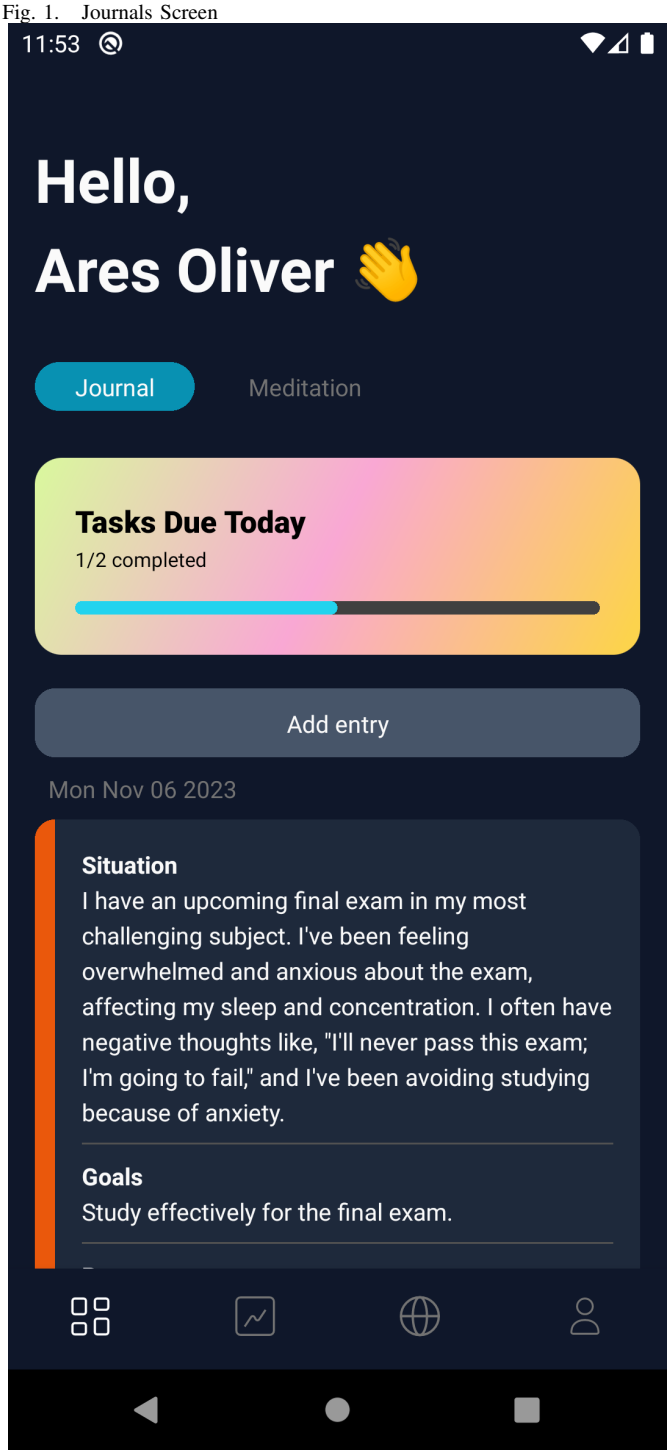


Fig. 2. Meditations Screen

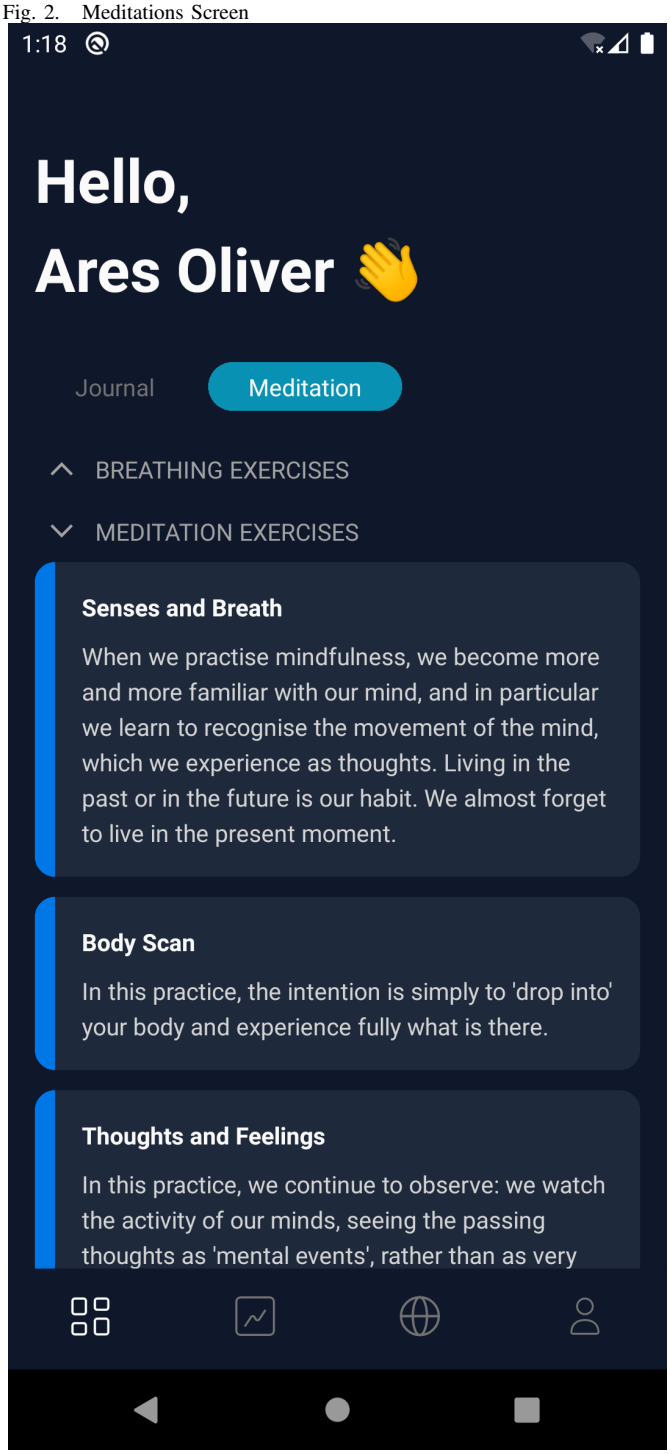


Fig. 3. Stats Screen

Fig. 4. Helplines Screen

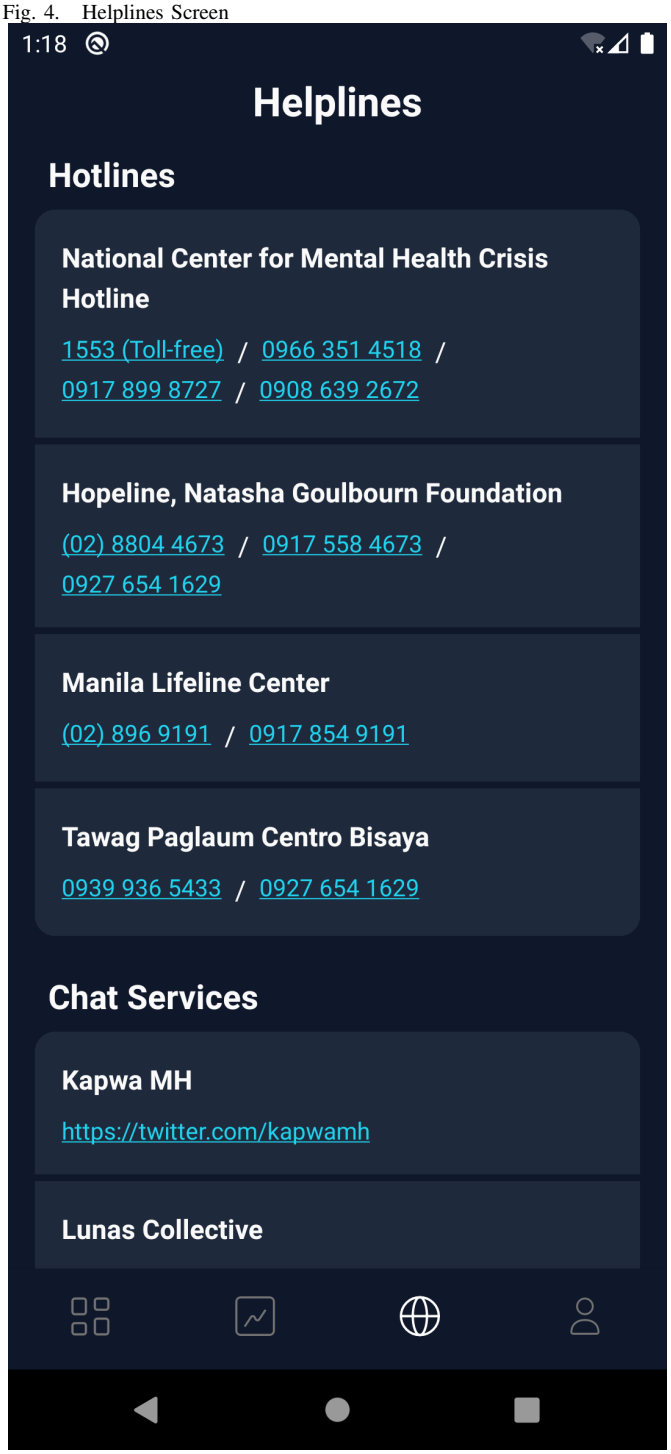
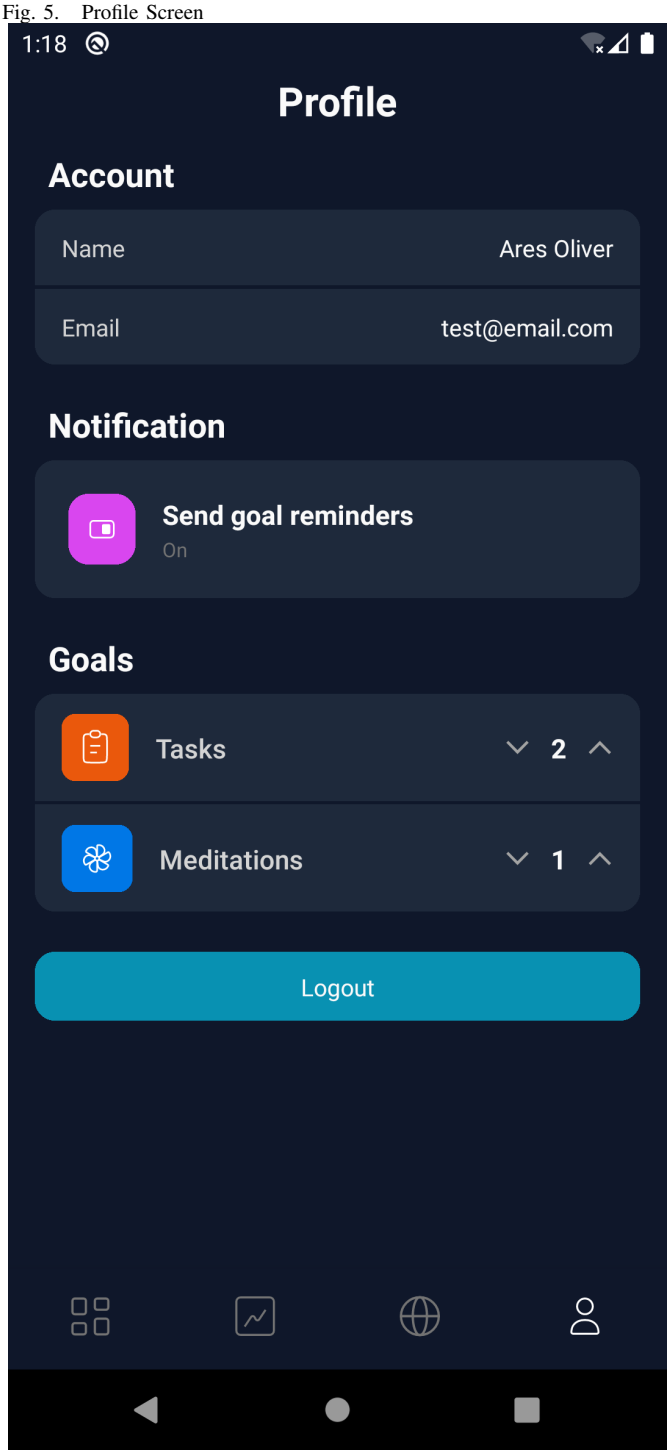


Fig. 5. Profile Screen



APPENDIX I
BECK'S DEPRESSION INVENTORY (BDI-II)

This questionnaire consists of 21 groups of statements to be answered by picking out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. The items are as follows:

1) Sadness
2) Pessimism
3) Past failure
4) Loss of pleasure
5) Guilty feelings
6) Punishment feelings
7) Self-dislike
8) Self-criticalness
9) Suicidal thoughts or wishes
10) Crying
11) Agitation
12) Loss of interest
13) Indecisiveness
14) Worthlessness
15) Loss of energy
16) Changes in sleeping pattern
17) Irritability
18) Changes in appetite
19) Concentration difficulty
20) Tiredness or fatigue
21) Loss of interest in sex

APPENDIX II
SYSTEM USABILITY SCALE (SUS)

The System Usability Scale is a Likert Scale which includes 10 questions which users of your website will answer.

Participants will rank each question from 1 to 5 based on how much they agree with the statement they are reading. 5 means they agree completely, 1 means they disagree vehemently.

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.

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