MoodTracker

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ABSTRACT
The MoodTracker application’s goal is to create a technological aid for therapy patients, and those implementing cognitive behavior therapy. Based on Cognitive Behavior Therapy principles, the application engages its target users to conduct therapeutic exercises. This paper details the process of design, testing, and refinement of the MoodTracker application. The application is written for Android mobile devices.

KEYWORDS
Cognitive behavior therapy, technology, mobile application, user interface

INTRODUCTION
Cognitive Behavior Therapy (CBT) is a form of therapy that uses a systematic approach to address mental issues, such as, depression, eating disorders, or many other mental illnesses or destructive behaviors. A major component to CBT is paying close attention to a patient’s thought patterns to treat their disorders (Martin, 2007). CBT is generally practiced within short, weekly therapy sessions, but therapists also generally assign work for patients to do between sessions. CBT is most effective when patients continue their work consistently between therapy sessions. However, it is hard to remember to record and track moods and thoughts over time. Even with consistent daily journal entries, it is extremely time consuming for the patient to get any usable data out of their mood records.

MoodTracker was designed to address these issues involving the application of CBT. The goals of the project are to provide a convenient, fast, and easy way to record mood information and process this information to make it more useful. By achieving this goal, our users will get the most out of therapy.

MoodTracker is a mobile application written for the Android operating system. It has several features: a mood recording system, a graphical system for viewing data, an export data feature, a way to track medications, and a way to record notes. The design is minimalistic to facilitate easy integration into the user’s life.

PREVIOUS WORKS
eMoods Bipolar Mood Tracker is a mood tracker designed specifically for those who are bipolar. Like MoodTracker, it offers the ability to track medications taken. The application has four variables which users can input intensity levels for: depression, anxiety, elevated, and irritability. eMoods also offers a graph displaying the different input variables. There are no positive emotions in the app, which makes the app negatively focused. The application has a narrower audience than MoodTracker, since eMoods is designed for those with bipolar disorder.

Mood Panda is a mood tracking app developed for the iPhone. It offers several features similar to those in MoodTracker such as rating mood as on a number scale, providing visualizations, such as, graphs of mood versus time, and journaling capabilities. However, MoodPanda is intended to be used as a social application,
which is a deterrent to certain users, because not everyone is comfortable sharing personal information, like their emotions, to a wide audience. MoodTracker has the ability to share information with others, but allows for maximum privacy as the user shares their moods only with those they choose.

**Mood 24/7** is a mood tracking website that uses text messaging to keep track of moods. This limits the mobility of this application, and the functionality on the phone. However, this does allow Mood 24/7 to be accessed by all text-message enabled devices, not only Android. It does allow health professionals to follow a patient's mood timeline.

**T2 Mood Tracker** is a mobile application developed by the National Center for Telehealth and Technology to improve the health of military personnel and veterans. The application comes preloaded with anxiety, stress, depression, brain injury, post-traumatic stress, and general well-being categories, each with ten or more variables that can be set using sliders. The ability to create custom categories is available. T2 also has a note-taking feature. The application is highly complex, which makes it harder to use consistently and quickly.

**DESIGN**

The Mood Tracker interface design has an overall structure of three tabs, which separate the MoodTracker application into three logical sections: Mood Input, Graphical Representation, and Medication Tracking. These tabs allow quick access to all parts of the MoodTracker application to the user. Ease of use and speed are vital to our design, since the faster and easier it is to use, the more likely the user will consistently use it. Frequent use will lead to better results in therapy or their treatment plan.

The following sections detail the design and functionality of the high fidelity prototype developed for usability testing. The prototype is not representative of the final design of MoodTracker, but will allow for feedback from possible users into our design. Details about the findings of the usability tests and further design changes are included later in this paper.

The Mood Input (fig. 1) screen is the first screen that the user sees when opening our application, as most users are expected to use this function daily. Every screen is designed so all content appears on the screen, which eliminates the need for scrolling and makes features easier to find and use. MoodTracker utilizes widgets that pop-up secondary input menus to make sure the interface remains visually simple.

There are two ways of interpreting mood in the application. The first is a quantitative value entered through a slider, which allows the user to choose a point somewhere between extremely positive and completely negative. Internally, this value is interpreted as a number by the application. The second is a qualitative mood description, which is selected from a drop down menu. This allows the user to track their mood in two ways: positivity and by a concrete label. Examples of possible input would be a 7 and Depressed, which would be a more intense feeling of depression compared to a 3 and Depressed. By using this method MoodTracker can graph positivity over time or show how...
frequently a user feels a concrete emotion. Finally, an optional note field is included in case the user wants to record the context or the triggers for the mood they are recording.

The Graph Mood Screen (fig. 2) provides valuable feedback to the user. Simply tracking the mood is useless if the data can’t be compiled and easily relayed back to the user. MoodTracker has two methods of displaying information, which involves a line graph that would track mood positivity/negativity, and a circle graph that tracks percentage of different moods felt. The design utilizes two drop down menus to allow the user to select exactly what time span and medication data will be shown.

There are four buttons displayed on the screen: Line Graph, Circle Graph, Clear Graph and Export Data. Clicking the Line Graph or Circle Graph buttons generates a graphical representation of selected data to display to the user. The graph can be easily cleared with one click of the “Clear Graph” button. The “Export Data” button prompts the user for an e-mail address that they can send the data as an excel spreadsheet themselves or a therapist.

The Calendar/Meds Screen (fig. 3) provides users with an easy way to view past mood entries, and to view and edit the medications that they currently taking. The calendar allows for the selection of a specific date, which reduces the amount of information shown at a given time. The user can click also on View/Edit Medications or View/Edit Alarms, both which open to a separate screen. Each of these screens presents a list of existing (previously entered) medications/alarms, which are editable by clicking on them. When editing or adding a new medication or alarm, users are presented with a popup asking for details such as time and recurrence (for alarms), or medication name, dosage, and length of regimen (for medications). Alarms are included in the application so that users can both set reminders to record their moods, and/or set reminders to take medications. Medication start/end dates can be used for graphing mood data.
This diagram shows the process flow between the different features and screens of the MoodTracker Application.

**DEVELOPMENT PROCESS**

The first step in the development of MoodTracker was to decide on a set of core features that would make the application both practical and useful to a user. When deciding these important inclusions, the team made sure to consider the problem, design approach, and target audience. This process began by generating several user scenarios. This method allowed for quick identification of a core set of features. In cases such as this, Shneiderman states that “many designers have found day-in-the-life scenarios helpful to characterize what happens when users perform typical tasks” (Shneiderman, 2010). Each of these scenarios describes a typical use of the MoodTracker app by a specific user, such as a middle-aged male using MoodTracker to help with a current therapy program or a young woman, who is using MoodTracker to complement self-help books. By analyzing these detailed scenarios, it
was possible to understand what features would be important to our users in various situations.

**Feature List**

Using several user scenarios, and further brainstorming within the team a list of core features was compiled. The features describe the core functionality of the application, and how they work together. The following is the list of core features that were decided to be critical to the MoodTracker application.

1. Input mood data, such as, emotion, mood intensity and related notes
2. Input medication data such as type, dosage and duration of use
3. View/edit previous mood and medication entries
4. Visualize data in chart/graph form
5. Export data via email to a personal computer in excel format
6. Set alarms/notifications to prompt user input

**Low-Fidelity Prototypes**

With a set of core features in mind, the next step in the development process was to create a series of low-fidelity prototypes. The team considered many of the broad principles that would play a critical role in the success of the application. Among the principles were the 8 golden rules of interface design, suitable interaction styles, and mobile device specific design constraints. At this point each team member designed a low-fidelity prototype using Pencil, an open source GUI prototyping tool, along with several Android development plugins. The use of Pencil allowed for easy visualization of screen layouts and user input options. For each prototype a set of screen shots was created to represent an implementation of the core features. Two of the main screens from the low-fidelity prototypes are illustrated in (fig. 4) and (fig. 5).
High Fidelity Prototype
The next phase in the development of the MoodTracker app was to create a high-fidelity prototype that would be used for usability testing.

The first step in this process was taking the low-fidelity prototypes, combining them and improving on their design. Some features were re-organized to be on different screens, or combined to make mash-ups of implementations.

Following one of the guidelines for usability testing presented by Dr. Shneiderman: “Create prototypes using the most appropriate technology for the phase of design, the required fidelity of the prototype and the skill of the person creating the prototype” (Shneiderman, 2006), the team decided an Android emulator published by Google to be the best option.

USABILITY TESTING
In order to assess the effectiveness of our high-fidelity prototype the team created a usability test to administer to potential users. The test consisted of four sections: the test instructions, a pre-test questionnaire, a series of tasks for the test subjects to complete and a post-test survey.

Test Introduction
The introduction to the usability test allowed the team to combat two key issues. First, it explained to the users the purpose of the testing, and assures them that it is the interface being tested and not their abilities. Second, it goes into detail about the structure of the test. This includes detailed explanations and instructions for the following three portions of the test. The introduction was designed to be short but properly prepare the testers for the usability study.

Pre-Test Questionnaire
The pre-test questionnaire consisted of four simple questions that helped to categorize the testers in regards to MoodTracker’s target audience. They also provided helpful information for the analysis of the post-test survey questions. The questions asked were about the visual abilities of the testers, their age group, the amount of exposure they’ve had to Android, and their confidence with current technology. The testers had a wide range of level of experience with Android devices.

Usability Tasks
The usability test consisted of a series of tasks the tester would carry out. All testers carried out the same tasks. Tasks included inputting a mood input entry, adding a medication, and looking at a graph. The list of tasks was designed to have the users navigate through the majority of the interface, and interact with the most important screens and features. The following is an example of one of the tasks the testers completed.

Simple Task A
1.) Open the MoodTracker application on the Android device.
2.) Navigate to the Mood Input selection screen.
3.) Input your the mood ‘Happy’ and intensity ‘4’ using the interface.
4.) Click ‘Submit’.

Post-Test Survey
The post-test survey consisted of six questions. The first 3 questions were semantically anchored survey questions that asked the users to rate the ease of using each of the 3 main screens on a scale between 0 (easy) and 9 (difficult). Using these questions gave access to numerical data that allowed the team to easily graph and spot trends in the user’s responses. The chart in (fig. 5) summarizes the data gathered from each of our 5 users.

The chart clearly shows that overall the users had the easiest time understanding and using the mood entry screen, followed by the graph screen and they had the most difficult time with the medication entry screen.

The final 3 questions on the post-test survey were short answer questions, asking the user to comment on the strengths and weakness of the MoodTracker. The answers to these questions
were strongly related to the user’s opinions on the first three questions. However, these questions offered greater insight into what specifically the users liked and what was causing them difficulty. We used these answers to create short summaries of the experience each user had. The following are a few of the key points that the testers made.

Figure 5: Post-Test Survey Results

1. Certain features were hard to locate due to poor organization/labels
2. Feedback should be offered when using the mood input slider.
3. Color and design should be improved to make the app more visually appealing.
4. Readability of graphs needs improvement.

REVISIONS

From all of the data that was gathered in the usability tests, many areas were identified that need further development and/or improvement. The following section details the state of our application at the current time and the areas we identified for future revision.

Final Status

The final status of the MoodTracker project is that of a mostly complete user interface, but without any backend functionality implemented. Additionally, there exists some room for improvement in the user interface. Currently there are no tabs in the interface, despite them being part of the design. This was a development decision made based on current time constraints. There are also some minor improvements that can be made by employing the use of custom graphics.

Future Development Plans

Work that still needs to be completed before the application is fully functional can be described as six distinct tasks:

1. The tab structure of the application needs to be redesigned in accordance with the standard android tab libraries.
2. The set of moods presented as options during mood input should be further researched in order to provide a comprehensive set of options to the user.
3. A backend database must be implemented into which the mood input and medication/alarm data can be stored. Having this data retained is necessary for the implementation of the remaining three tasks.
4. Graphing functionality needs to be implemented drawing on the mood data stored in the database. Android libraries already exist that can accomplish this task.
5. Email functionality and database export to excel formatting must be implemented to send a comprehensive mood/medication log to users.
6. The alarms/reminders set in the calendar tab need to make system-level calls to set/edit the device’s built in alarms.

Recommendations to Future Developers

Two major recommendations for future developers involve the graphing portion of the application. First, it is recommended that future developers carefully choose what graphing library or classes they use within the application. The MoodTracker team suggests the Graph View Library (Gehring, 2011). Additionally, further research and testing needs to be done to figure out the best way to display the graphs. Also implementing gestures would be a good way to improve navigation. Instead of relying only on tabs, users can swipe their finger across the screen to get to the next screen.

CREDITS

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REFERENCES


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