

Research Proposal

Introduction

For our project, we have chosen to create a mobile app that will help college students manage and keep track of their mental state of mind. As students, we know that there are many factors that can contribute to stress and fatigue which, if persistent over long periods of time, can lead to emotional strain in many people. We realized that it would be helpful for students to have a tool which would allow them to keep track of their mental state over the course of weeks, months, or even years so that they can see trends and identify what may be causing depression or other issues.

Our app will allow users to rate their overall mental state every day. Based on the response, the app will provide some feedback to the user which will either encourage him/her to keep it up if they give a good rating, or suggest some ways to improve their mental state if they have given a bad rating. For example, if the user is having a bad day, the app will provide a response like “You should give your best friend a call and see if he/she wants to hang out” or “Here is a list of events happening in your area tonight, go out and check one of them out!”. These responses are just examples; the ones used in our actual product will be based on research that we do to determine what types of activities tend to help people improve their mood.

The overall goal of the app is to encourage college students to stay positive and develop habits that are proven to relieve stress and promote overall happiness. This app is not meant to replace the need to physically see a therapist or a counsellor, but rather as a supplement to give a better perspective and grasp of one’s state of mind.

Motivation

Mental fatigue and stress is a prevalent problem everywhere, especially on college campuses where it is often massively overlooked. There is a significant portion of college students in the United States who struggle with these issues, and this app would serve to help them on a weekly basis. These students often feel alone and many of them don’t have a stable support system to help them with these issues [2]. Simply enough, there aren’t many apps currently on the marketplace designed specifically to help college students assess their current well-being and this app will fulfill the need of monitoring mental state and providing feedback for those who use it. It is meant to help college students keep track of their mental state as it is very easy to ignore, or forget about in a busy day to day schedule.

Many cognitive psychologists believe that empirical methods of research can be extended and applied to several technological applications without having a physical way of conducting observations. Today, mobile technologies are pervasive and intervening in our day to day lives. These interventions are applied “in-the-moment” using technologies that people carry around with them. This process allows the potential to provide a ubiquitous connection between a care system and the patient by allowing the applications to observe based on user input [3]. A study that monitored usage of behavioral intervention technologies (BITs) in handheld devices concluded that BITs have positive short term benefits for anxiety disorders, eating disorders, bipolar disorder and schizophrenia [1]. The data collected through this technology allows for a passive analysis of a user’s psychological state that can be helpful in monitoring one’s state of mind. Moreover, it promotes social interaction in an effort to help the user

overcome stress or mental fatigue. BITs provide promising avenues for creating new streams to deliver resources for the prevention of mental stress.

Methodology

For methods in this research project, first we will conduct usability testing which allows users to complete a set of tasks. While users are working on tasks they will encounter problems, then we will proceed with a heuristic evaluation which will help identify the problems with usability in the UI. Then we will do a cognitive walkthrough to evaluate the usability in which more than one evaluator will work on the series of questions from the perspective of the users. We will use all the information that was gathered from research and define design components to make a rough UI. This is to give some ideas on how users will use the product to better help with managing and keeping track of their state of mind. This is one of the important processes and it helps to define an interactive design to better meet user needs. We will bring the participant for our study to the experiment station, and start off by giving a brief introduction of our research to the participant. After that, participants will be given a short pre-survey, followed by interactions with the UI. Once they are done with that, they will complete a post-survey.

Most of the information will be gathered from the pre-survey and post-survey. Some examples of the questions that will be on the pre-survey are: What is your Gender, Age and Race? What is your major? Are you living on campus or off campus? Do you have any history in research study? If so, how many? Based on our brief overview of the project, what are your initial expectations of the app? Some examples of the questions that will be on the post-survey are: What was your overall experience with the app? Do you think this app would help you with stress? What suggestions do you have for us to the improvement of the app? What features do you want on this app that will make it better? Did the app reach your initial expectations?

With all the data that we collect from the pre-survey and post-survey, we are going to remove the outliers, and then analyze the data to create a plot to find correlations. Then, we will create a pivot table which would show the mean, standard deviation, minimum and maximum. We will use a Python script to perform a *Sentiment Analysis* on the responses gathered from the user research. This analysis is going to be used for more intimate responses about the user's state of mind. This analysis is an algorithm that implements machine learning by using a pre-defined collection of words with an assigned score for each. Depending on the words used in the responses, the goal of the algorithm would be to predict the nature of the responses as either being *positive* or *negative*. If the responses are deemed to be negative, the app would require further improvements.

After analyzing the results from the data that was collected, we will take the user feedback from the post-survey to update the UI, and, in essence, producing a fully functionable application that would track and hopefully alleviate the mental stress of college students. Finally, we as researchers will compare the initial product design with the end product to determine how much variation there was in the design, if any. This will help us figure out if the standards of our problem definition met our end product.

Team Resources

Each of us is equipped to research our field both through journals and scholarly articles as well as asking friends and peers of their experiences and then analyzing that data, identifying commonalities and outliers, and then condensing and presenting that information within the project report

Bhavik Suthar is senior in Computer Science with a Business Administration and a Digital Production Arts minor. He has previously done undergraduate research in eye-tracking class at Clemson University where he has had to analyze data and statistics from numerous scientific papers. Having a DPA and creating new design and patterns using Adobe Illustrator and Photoshop skills will help the team with designing the UI. Having previous experience

with doing a research study in Eye-tracking will also help the team decide what data is irrelevant to not remove from the research.

Ross Bullock is a senior Computer Science major with a minor in Digital Production Arts and Spanish. He has taken classes at Clemson where he has had to do various research regarding mental health issues such as depression, anxiety, and suicide, especially as it relates to college students. He has also presented his findings and analysis in the same classes including the resources that Clemson has available to its students surrounding mental health. In addition, his DPA minor has given him experience with different Adobe products, including After Effects and Photoshop, which could be useful in helping to develop the front-end of our application.

Keerti Kosana is a senior Computer Science major with a minor in Business Administration. She has experience working in a bioinformatics research lab that involved analyzing huge amounts of data using machine learning models. In the past, she was part of a design team that built a tool to detect financial fraud in Blackbaud's Financial Edge NXT. She also works at the Cybersecurity Operations center at the Watt Innovation Center, and frequently analyzes raw machine data using services like Splunk. With her skillset, she would be able to analyze user research, and come up with feasible design implementations to execute the application discussed extensively in this research proposal.

Eric Paulz is a Senior in Computer Science. He has some course-related experience with research at Clemson through classes such as HPC Fault Tolerance and Virtual Reality Systems. He also has experience conducting computational research at BMW's IT Research Center in Greenville, SC. This research included a large amount of data science and data visualisation tasks, which will be helpful in collecting and presenting the results from our research this semester. He wrote a technical research paper while working at BMW, and is currently awaiting its approval for publication.

Since mental fatigue and stress issues are relatively common on college campuses, we have determined that we will contact friends, acquaintances, and other members of the Clemson community via email, text message, flyer, or a poll for user input with regards to this project.

Proposed End Product

We want our end product to be a user-friendly mobile application that is intuitive to use, visually appealing, and genuinely helpful for our target user-base. We want it to be something that is minimally intrusive in everyday life. For example, the user can set a time that is optimal for them to log their results everyday. At that time, the app will send a reminder that it is time to record how they have been feeling that day overall. Now for some specifics as to how we envision the app working.

We want the User Interface to be as inviting and positive as possible. In order to achieve this, we will have to do some research to find out what types of colors, shapes, fonts, etc., have been shown to promote positivity. Also, we want using the app to be a pleasant and enjoyable experience. Animations should be soft and gradual as opposed to quick and sharp. For example, moving from screen to screen should be a fade-in/fade-out or a gradual sliding motion and not a snap to the new screen. Again, these are our preliminary speculations, and are certainly subject to change once we have done some more research.

When the user opens the app, he/she will be asked to rate how they have been feeling that day overall on a scale from 1 to 5 (1 meaning super stressed or just down, and 5 meaning it's been a great day and they are happy). Next, that screen will either fade out or slide away, and the next screen will appear. Based on the rating from the previous screen, the app will provide some feedback to the user, taken from a preset pool of responses that we have provided. Here are some use case examples:

Use Case #1

The user enters a 1. They are having a really bad day and feeling very stressed. Maybe it's exam week and he/she hasn't had much free time lately to blow off steam. The app can recognize that, present a graphic or image that conveys positivity (maybe we could have the user provide some photos or thoughts that make them happy and reintroduce these in situations like this), and provide some textual response like "You've been working really hard lately. Give your best friend a call and go do something fun! You deserve it."

Next, the app could ask the user if he/she would like to be able to talk to a professional about how they are feeling. If the answer is yes, the app would provide the name and contact information for various professionals nearby that are available to talk.

Use Case #2

The user enter a 3. This isn't too bad, but it also isn't as good as it could be. The app could provide some feedback such as providing a link to a list of local social events that are happening on campus or nearby that day and suggest for him/her to attend one of them. It's been shown that isolation is detrimental to mental health, and that social interaction is one of the best ways to improve one's mood and provide a sense of comfort and accomplishment.

Use Case #3

The user enters a 5. This is excellent. The app will provide some feedback such as "You're doing awesome! Keep it up and you'll be on an X day streak!"

After the daily survey is filled out and all of the feedback has been given, the user will be able to view a dashboard that will show the results from what they've entered over the past week, month, year, or possibly more. The user will have control over how far back they want to look, and he/she will be able to recognize trends in the data and attempt to identify what types of things or events tend to make them feel down and stressed out.

Project Timeline

Date	Goal	Notes
9/14/18	Team Meeting	Discuss and finalize research proposal
9/18/18	Research Proposal due	
9/21/18 - 9/24/18	Interview participants	
9/26/18	Regroup: analyze data, observe patterns	
9/28/18	Start to synthesize research into paper	
10/2/18	Regroup: make final edits regarding paper	
10/4/18	User Research Paper due	Include results of user research

10/12/18	Regroup: analyze results	
10/19/18	Regroup: Finalize the standards/requirements for the application	
10/23/18	Requirements Paper due	
10/26/18	Regroup: Get started on front-end	
10/30/18	Regroup: Finalize the design prototype	
11/1/18	Prototype Paper due	
11/8/18	Regroup: work on prototype	
11/13/18	Design and Digital Prototype due	
11/14 - 11/26	Conduct user research with the prototype	
11/27/18	User Evaluation	Include results from user research with prototype
12/3/18	Regroup to edit final paper	
12/6/18	Final Paper due	

References

- [1] Burns MN, Mohr DC. eHealth, Telehealth, and Telemedicine, in Encyclopedia of Behavioral Medicine. In: Gellman MD, Turner JR, Editors. New York: In Press, Springer.
- [2] A.E. Kazdin. Evidence-based treatment research: advances, limitations, and next steps
Am Psychol, 66 (8) (2011), p. 14p
- [3] Anderson, J.R. , ed. (1981a). Cognitive Skills and their Acquisition. Hillsdale, New Jersey: Lawrence Erlbaum Associates.