Appiness: An Application to Promote Mental Wellness

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ABSTRACT
This work presents the development of a mobile wellness application, Appiness, designed to promote positive interactions between users and their mobile devices to address the growing concern of mental health problems. Motivated by the tragic passing of a former student, the team recognized the need for freely accessible tools and treatments to help those who may be afflicted by mental health issues. Appiness seeks to remind users of their achievements, big and small, and uplift their mood during times of stress, anxiety, or depression through positive quotes, interactions, and other methods. The application is designed to be simple yet effective, with the aim of bringing its users happier moments, better days, and an overall more positive outlook. The development of Appiness was guided by the principles of Human-Computer Interaction and involved a user-centered design process with continuous feedback from potential users. The goal is to create a tool that can help promote mental wellness for people of all ages, especially those who may be at risk of mental health issues like college students.

Author Keywords
mental health; mobile application; wellness; positive psychology; user experience; usability testing; human-centered design; user feedback; self-care; achievement reminders.

ACM Classification Keywords
• Human-centered computing: User interface design and evaluation • Computing methodologies: User-centered design • Human-centered computing: Interaction design theory, concepts, and methodologies • Computing methodologies: Iteration, evolution and prototyping • Information systems: User-centered design

INTRODUCTION
On December 20, 2020, Mills Griffin, a former Clemson engineering student and a fraternity brother to one of our team members, committed suicide in his own home at the young age of 23. Mills' tragic passing was a harsh reminder of the true severity and gravity of mental health problems. Furthermore, it illuminated how those around us, even those who seem the happiest, may be afflicted by serious mental health issues and have little to no means of seeking help. Driven by these ideas, this team saw a clear need for more freely accessible tools, remedies, and other mental health treatments, and this notion ultimately gave birth to Appiness.

Appiness is a mobile wellness application designed to promote a positive interaction between users and their cellular devices. People everywhere suffer from mental health issues. The National Alliance on Mental Health has estimated that 1 out of 5 U.S. adults (ages 18 and up) suffer from mental illness every year, every 1 in 20 U.S. adults suffer from serious mental illness every year, and even 1 in 6 U.S. Youth (ages 6-17) experience some sort of mental illness every year [6]. As it is evident that people of all ages may be at risk of mental health issues, Appiness sets out to be a simple yet positive mobile application designed to promote a positive interaction between users and their cellular devices. Appiness seeks to remind users of their accomplishments, ranging from small daily achievements to major life goals, and uplift their mood when they may be feeling stressed, anxious, or depressed through positive quotes, interactions, and various other methods. In summary, this team aims to bring its users happier moments, better days, and overall a more positive mood through their interactions with Appiness.

PROBLEM AND MOTIVATION
Apps focusing on improving mental health are not a new concept. Currently there are dozens of apps on the market that aim to improve users mental health through therapy, anxiety reduction, meditation, sleep help, stress relief and more. Apps like Talkspace connect users to mental health professionals. Headspace guides users through meditation, and Moodkit is designed to help users track their moods [1]. However, many of these apps require monthly subscriptions or an upfront cost. For example, Headspace which requires a monthly subscription of $12.99 [1]. Along with the costs, many of these apps target specific mental health issues or needs like anxiety or depression and are less focused on mental wellness in general. This is where we believe there is

a gap to be filled, by providing a free or low cost application aimed at boosting the general wellbeing of young people we are filling a void in the mental wellness app field.

As we thought through the best method of providing mental wellness services to the average young person, we landed on creating a mobile application as the final end product. An application that is available on a smartphone would have the widest reach and be most convenient for users to access on a daily basis at any time during the day. As of 2021, 95% of 18-29 year-olds have owned a smartphone in the past five years [2], meaning that a mobile application is easily attainable for a majority of people in our target demographic. Along with having a wide reach, a mobile application would allow the user to easily interact with the product at any time or place during the day. Whether they are at home or on the go, the users can have access to the app when needed. Finally, we wish to incorporate a notification system into our application. Notifications are a common feature of mobile apps that users would be familiar with. Having the application on a mobile device would also mean that notifications are more easily seen by the user.

Numerous articles have been published in the field of HCI dissecting the effectiveness of mental health applications. Many of these articles suggest that wellness applications have the potential to expand the availability and quality of mental health treatment [3], as well as be a useful interventional tool and supplement to existing treatments [5]. However, research from the basis of an HCI perspective is limited in showcasing the efficacy of these apps as evaluating the efficacy of the applications is beyond the scope of HCI and requires research from medical, psychological, and other fields [4]. Some HCI research did suggest though, that high efficacy apps did have app patient engagement, a simple user experience, and self monitoring features [7], which we will keep in mind as we design the look and interactions within our application.

INITIAL USER RESEARCH

To perform our initial user research, we administered questionnaires and conducted interviews with members of our target demographic.

Participants

Our target demographic consisted of students and young adults between the ages of 18 and 25. Users within this demographic would most likely own a smartphone and therefore be able to use an app such as the one we are developing. To find users in the target demographic, we used convenience sampling to survey and interview students in proximity to ourselves at Clemson University.

Methods

Questionnaire as a Means of Eliciting User Expectations

Questionnaires were administered to users in our target demographic in order to gather information about feature preferences and to learn more about our user's feelings towards, and experiences with, mental health. The questions asked were concerning their familiarity and level of comfort with mental health mobile applications and proposed app features. The survey was of our own design.

Procedure

The questionnaire was distributed to the participants via Google Forms. There, the responses of the participants were recorded and analyzed to gather the needed information to complete the design of our application. Information that could be used to identify the participants, such as name, email, date of birth, etc. was not collected.

Purpose and Rationale

The questionnaire primarily focused on users' opinions towards possible application features as well as how receptive they may be to using an app geared towards mental wellness. We have already determined several possible application features, and the questionnaire allowed us to gauge user's initial reactions to these features and derive which features are most important and which are least important to our user base. The closed format of the questionnaire would also be a way to gain easily quantifiable data about the users opinions and preferences.

Description

The questionnaire created consisted of questions within three main categories: demographic information, mental health, and app design/features. In the demographic section, we collected information pertaining to the participant's age, gender, and major as well as information regarding their use of smartphones and technology. In the mental health section, users were asked about their own mental health experiences and how an application may apply to them. Finally users were questioned about possible application features and then given room to respond with any other comments or concerns. The exact questions administered through the questionnaire are listed in Appendix A.

Structured Interviews as a Means of Eliciting User Expectations

While the administered questionnaires primarily gathered closed responses, we also conducted several structured interviews in order to gain a deeper understanding of our users' opinions towards certain features and mental wellness topics. Five interviews were conducted with participants in our target demographic.

Procedure

Each interview consisted of the interviewer sitting with the participant either in person or over a video call asking the questions listed in Appendix B. Participants were allowed to speak freely about each question and could respond to the questions in more detail than those that completed the questionnaire. Each interview took between ten and thirty minutes to complete depending on the depth and length of the responses from the participants. Interviewers did not stray from the script during the interviews.

Rationale

We decided to use structured interviews in addition to the survey/questionnaire, as it allowed us to gain more detailed information from our user group. While the questions asked by the interviewer were set, the participants were able to answer with more detail and perhaps better express their ideas and opinions on a subject than they may have been able to do within the survey. Participants could respond to a question with as much detail as they preferred, allowing us to gather data that may have been unexpected or unattainable through the survey alone.

Analysis

To analyze the interviews, we performed a general content analysis of the interview transcripts. From the transcripts we created a summary of each interview. Using the transcripts and summaries we were able to identify the opinions and feelings towards our proposed application of our users at a very high level. We made sure to note which topics or opinions were shared among multiple participants as well as where they each differed.

User Research Findings

In this section we will present our findings from both the questionnaire and the user interviews. At the end of this section, is a list of the key takeaways from the user research as well as how those takeaways impacted our prototype design.

Findings from Questionnaires

In total, our questionnaire received eight responses. Using these responses, we were able to gather the data to determine the needs and wants of our target demographic.

Looking at basic questions related to mental health, as expected, over half of the respondents reported that they currently experience stress, anxiety, depression, or other mental health issues. Of those that struggle with these issues, most of them experience it weekly and monthly, while some experience it daily. Seven out of eight of our respondents do not currently use an application to assist them in improving their mental health, with six out of eight saying that they will consider using an application to assist with improving their mental health.

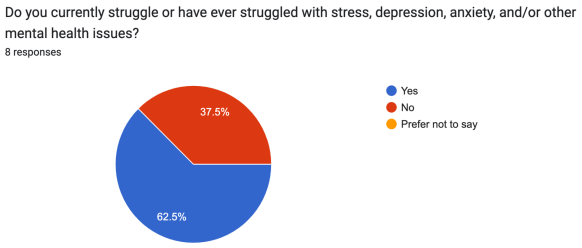

Figure 1: Percentage of respondents who struggle with mental health issues.

For questions directly related to our app design and feature set, we used, for the most part, questions based on the Likert scale. The likert scale is from 1-5: 1 being not beneficial at all and 5 being very beneficial. The following figures show the results from these questions.

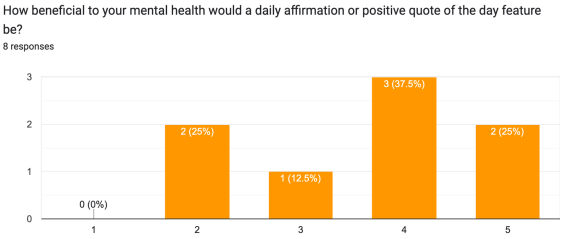

Figure 2: How beneficial would daily affirmations or positive quotes be?

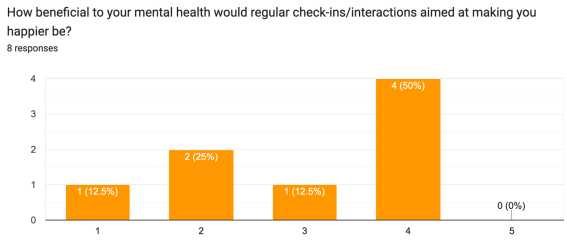

Figure 3: How beneficial would regular check-ins/interactions aimed at making you happier be?

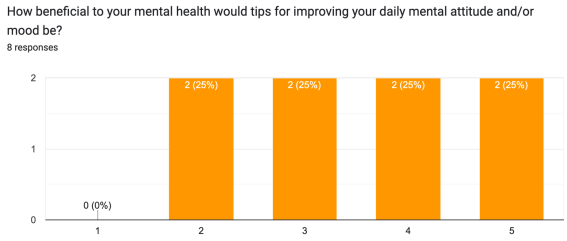

Figure 4: How beneficial would tips for improving your daily mental attitude be?

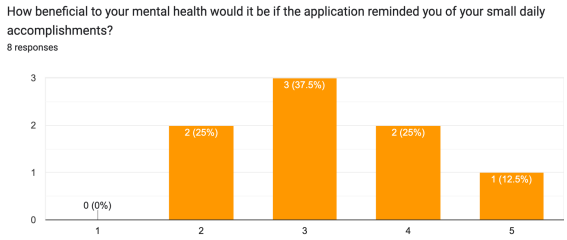

Figure 5: How beneficial would reminders of small daily accomplishments be?

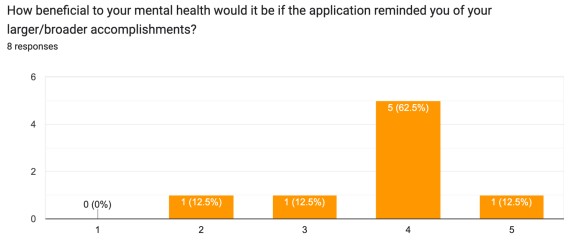

Figure 6: How beneficial would reminders of large/broader accomplishments be?

Our respondents indicated that the most important features for them were a daily affirmations feature and a feature for remembering positive accomplishments. We also found that the vast majority of participants would prefer only one notification per day from the application. Overall, these findings appear to support our initial app design concepts and feature set. Most of our targeted users deal with some type of mental health issue and currently do not have an application to assist them in improving their mental health. The Likert scale questions give us a gauge as to what features would be most important for users in their effort to improve their mental health.

Findings from Interviews

A total of 5 interviews were conducted as part of user research. These interviews were recorded and then transcribed so that we could look over each interview and its key takeaways. A summary of each interview was created which expressed the main ideas and desires of each individual interviewed. This information was then analyzed to determine which of our ideas the interviewees liked most and which of their ideas we could use to make the then current concept of Appiness better.

Of the five interview participants only one currently uses a mental wellness application, however; the other four interviewees said that they would be open to using one if they found one that they enjoyed using. These answers suggest that there is a lack of mental wellness applications currently available indicating a need for our application.

Most of the participants seemed to like the idea of some sort of daily check in system that is customizable to meet their specific needs. For example, Interviewee Four suggested that for his daily check-ins he would like

> "music suggestions, mental wellness/stress relief exercises, positive daily quotes"

while Interviewee Two stated that they would like the app to

> "prompt me to provide or think about some things that I am thankful for."

These are two different approaches to the concept, but both would fulfill the same goal for each person.

Based on the interviews, customizability should be an integral part of our app as Interviewee Three stated,

> "It should be adaptable to the person and what their needs are". Furthering this point, Interviewee One stated "everything manifests differently for every single person.

So, I think an important feature would be customizability."

If users could customize the number of notifications they are getting, the look and feel of the app, and the types of check-ins they are getting, it would make each user feel as though the application was made specifically for them. This theme of maximizing personalization for each user was quite prevalent in each interview as most people want something different from an application of this nature. Overall, the findings from the interviews were fairly consistent with the questionnaire and both aided in the design of the initial prototype.

Key Takeaways From User Research

Below is a summary of the key takeaways from the initial user research:

1. The majority of our target demographic struggle with stress, anxiety, depression, and/or other mental health issues and currently do not use an application to assist them in improving their mental health.
2. The features of a mental wellness app that will provide the most benefits are daily affirmations/check ins and reflections on positive accomplishments.
3. For the most part, users want a customizable experience as there is not a "one size fits all" solution to improving one's mental health as everyone is different.

Requirements Analysis

Using the results of our user surveys and interviews, we formed six main requirements that influenced the design of our prototype. All of these requirements were specifically designed to aid our user group in achieving their mental wellness goals and overall decrease their levels of stress and anxiety. These requirements were directly influenced by the information we received from our user group during the user research phase.

The first requirement is the application must have the ability to remember a user's past accomplishments. This feature will give the user the ability to look back on all that they have accomplished in order to provide motivation for the future and satisfaction as they look back on all they have done.

The second requirement is the application must provide a daily message to the user that contains a motivational quote, or a stress relief exercise. This feature will notify the user at a specific time each day and help motivate them or help relieve their stress levels.

The third requirement is the user is able to set the number of check-ins that they receive daily from the application. This will ensure that the user will not get frustrated by the amount of notifications they receive.

The fourth requirement is the user is able to customize the look of the user interface. More specifically, this feature allows the user to change the color of the application to a pre-set list of available colors.

Next, the fifth requirement is the application must include a daily advice/tips column for reading. This will give the user an easy way to better their mental health on a daily basis when they check in to the application.

And lastly, the sixth requirement is the application must include a mood tracking feature to gauge the user's mood throughout the day/week. By doing this, the application will be able to cater quotes and uplifting messages to a user based on their mood.

Prototype Design

We designed our prototype based on the results from our user research and the aforementioned requirements analysis. These six requirements were our main focus. To design the prototype, we used Figma, a web based software used for interface design.

The goal of this prototype was to create an application-like experience for our user group to evaluate. To do this, every button on the screen was actionable and represented real functionality. Pictured below in Figure 7 is the home screen of our prototype.

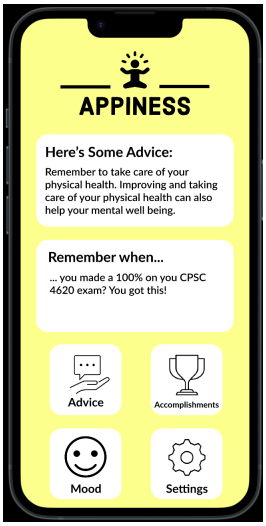

Figure 7: Home Screen of Appiness Prototype

To design this prototype, we utilized the iterative design process. We initially began by creating a small set of features based on the requirements from our user research, and then iteratively added functionality based on the explicit wants of our users. Each of these iterative changes led us to major improvements of the prototype from where we began. The final product of our prototype allowed us to conduct usability testing on our target demographic to further refine our design.

USER EVALUATION OF PROTOTYPE

Overview

To evaluate our prototype we conducted 10 usability tests with users within our target user group demographic. These tests were conducted with the intention to collect objective data about the usability of the Appiness prototype. Objective data such as time on task and error rate was collected as well as subjective data from the users with regards to the perceived ease of use of the application and other satisfaction measures. We believe that the methods used to conduct the evaluations give us valuable information to use to further develop and improve Appiness.

Methods

In order to evaluate the functionality of the Appiness prototype, we defined ten tasks for each user in the evaluation to perform. These tasks are listed below in the "Tasks" section. Each task was designed to touch every aspect of current functionality of the application. For each task we collected both objective and subjective measures. These measures are described in detail in the "Measurements Evaluated" section.

In order to conduct each test, a participant either sat with a member of the team while they performed the test or they screen recorded their test as they navigated the app. Participants were given the list of tasks and instructed to move through the Figma prototype to complete each task. Members of the team watched the users perform each task and recorded the time on task and any errors made by the users.

After completing the tasks with the prototype, users were then given a post test questionnaire. This questionnaire. This questionnaire consisted of questions related to the user demographics as well as more subjective measures related to usability satisfaction and ease of use. The responses from the questionnaire and the recordings made by the team member conducting the task were then compiled and analyzed.

Participants for the user evaluations were selected via convenience sampling. Each participant was a student at Clemson University. We had a total of 10 participants, with four being 21 years old, five being 22 years old, and one being 23 years old. Six out of our ten participants were male.

Tasks

Users were instructed to complete a total of eight tasks with the Appiness prototype in order to conduct the user evaluations. These tasks would take the users through all possible current functionalities and ensure that they interacted with every page of the app. Below is a list of the tasks users were instructed to complete. The list below is also how the tasks were presented to users:

1. Log in to the app.
2. Enter a new accomplishment.
3. Set the number of notifications for accomplishment reminders and calming exercises.
4. Change the number of notifications for uplifting quotes/messages to 1 and then to 3.
5. Change the app theme to Serenity Blue.
6. Enter a new mood for the day.
7. Read exercise, advice, and daily quotes from the "Advice" page.
8. Log out of the app.

Measurements Evaluated

For the prototype evaluations, both objective and subjective data was collected for each test.

With regards to objective measures, for each task the time on task and error rate were measured and recorded. For this testing, time on task is defined as the time taken to complete the task and error rate is defined as the number of errors made by the test participants while completing the task. We also recorded the completion rate of each task, or whether or not the participant was able to successfully complete a selected task. These measures allowed us to see what tasks or features may be causing the users the most trouble if their time on task was significantly high or if the error rate was more than other tasks.

Along with objective measures we also recorded the participant's perceived ease of use of the system when it came to completing each task. For this measure, participants were instructed to rate how easy they felt the system was to use to complete a task. They recorded their response using a Likert scale that ranged from 1 being "Very Difficult" to 5 being "Very Easy." This information was collected during the post test survey.
Finally, during the post test survey, users answered questions derived from the IBM System Usability Satisfaction Questionnaire, specifically the Subjective Satisfaction questionnaire. Each of the 20 questions within the questionnaire were on a five point Likert scale. The scale ranged from 1, "Strongly Disagree," to 5, "Strongly Agree." The exact questions in the questionnaire are listed in Appendix C.

Results

Throughout our usability testing, every team member collected both qualitative data, like perceptive ease of use and types of errors, and much more quantitative data, such as time to complete each task, number of errors per task, and the IBM Subjective Survey results. This team chose to analyze these aspects of the data as these facets serve as great indicators of the effectiveness of our mobile application. This section will cover and present both types of data along with any notable findings and statistical outliers.

Qualitative Data - Usability Testing

Appiness tested considerably well in both aspects of ease of use and intuitiveness. Throughout every usability test, every user was able to complete their assigned task in a reasonable time with a relatively easy perception of use, depending on the task. Specifically for the perceived ease of use, this is a different measurement from the quantitative (Likert) scale. Itt is derived from the subjective views from the team member administering the usability test and is inherently more categorical in nature, thus making more sense for it to be included in this section. For most part, there were a couple ranges of tasks that seemed to give users relatively more trouble and pause at a noticeable higher rate than others, those task ranges being tasks 2-3 and task 6-8. While the perceived ease of use fluctuated from "somewhat easy" to "very easy", an overwhelming majority of our tests saw relatively lower scores in these ranges. However, when inspected wholly, Appiness was picked up by users with significant ease and little error.

In addition to perceived ease of use, each team member also made sure to write down any other common subjective observations and errors. After accumulating all these notes, this team deciphered two common types of errors: technical errors and "tap-happy" errors. Firstly, within our prototype, there were unforeseen bugs, such as being able to select multiple numbers of daily notifications. As this logically does not make sense within the user's (or any reasonable) conceptual model of the application, this understandably confused and gave pause to the users who encountered this type of error. Secondly, other errors and hindrances seemed to come from our selected test users being "tap-happy". As this is a mobile application, some users seemed to tap the "screen" anywhere and everywhere at times and cause errors, especially when they did not know how to proceed for a certain task, like not being able to find the home screen from certain pages. However, after recollecting themselves, the users were able to right their wrongs and proceed normally. In summation, while there were a few minor mistakes and instances of trouble, users overall seemed to pick up Appiness with significant ease and intuition.

Quantitative Data - Usability Tests

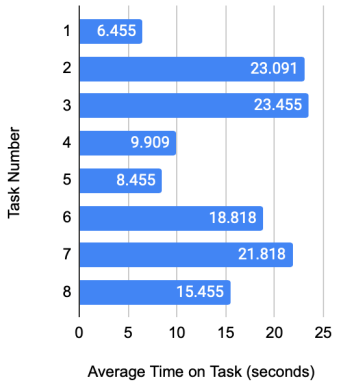

Figure 8: Average Time to Complete each Task

As shown above in Figure 8, the average time to

complete each task was under 30 seconds for every task. Specifically, tasks 2-3 and tasks 6-8 took on average notably longer than tasks 1,4, and 5, which all took under 10 seconds on average. However, this lines up with our earlier subjective and qualitative data noted during the usability testing, meaning that these tasks (for reasons and ramifications explored further in the "Discussion" section) were noticeably harder for users to complete.

Also, a noteworthy task to mention is task 8, where users are asked to log out of the application. This took considerably longer to complete than we expected, especially since the user was exposed to the "Log Out" button numerous times in previous tasks and the task is relatively easier in nature. As such, we considered this task to be an outlier, especially given its trivial nature. This is furthered by the number of errors (or lack thereof) for this task.

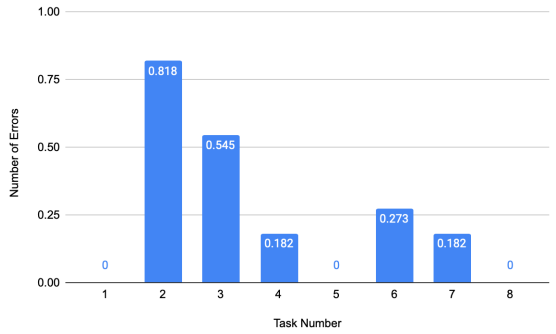

Figure 9: Average Number of Errors per Task

As shown in Figure 9, the average number of errors per Task were all under 1 with some actions having no errors at all, specifically tasks 1, 5, and 8. However, given that tasks 1 and 8 were logging into and out the application, both tasks that are relatively easy in nature, this was almost expected to happen. However, as previously mentioned, task 8 took somewhat longer than expected, strengthening its nature as an outlier. What this most likely means is that while users were still new to the application, they knew how to navigate the application to their desired destination – eventually.

The true outlier is task 5, where users were asked to change the application theme. One reason for this outlier to occur is that the previous task already had users in the settings page, meaning that there was little traversal within the application for the user was already in the right area to complete the task. To further back this theory, the average time to complete task 5 was 8.455 seconds, making it the second-fastest completed task. In summation, considering all the other notable and more actionable tasks took longer as expected, task 8 most likely owes its anomaly-like nature to its starting point within the application.

Quantitative Data - IBM Subjective Survey

After each usability test was completed, the user was given the survey listed in Appendix C and instructed to complete in accordance to how they felt about the application. This gave our team the opportunity to quantize how the users felt about Appiness, specifically through the IBM System Usability Satisfaction – Subjective Survey. After collecting the results from the users and analyzing the data, three trends became apparent.

Firstly, for the most part, all the tasks were rated positively for the most part, with 6 out of the 8 tasks receiving a majority of 4's ("somewhat easy") and 5's ("very easy") with a miniscule number of neutral 3's interspersed within the survey results. However, task 2 and task 8 were the only tasks to receive negative feedback, with both tasks garnering at least one response of 2 ("somewhat difficult"). At least for task 2, given it is the first substantial action within the application, it is understandable why some users would have issues and/or an unpleasant experience completing the task. However, task 8 seems to be a recurring anomaly in the fact that it was originally deemed an "ease-out' step by the team, meaning that we intended for the user to end on an easier step to help them mentally exit the testing session. In any case, this seems to indicate that in the next iteration of Appiness, the location, layout, and noticeability of the "Log Out" needs serious consideration.

Secondly, The System Usability Satisfaction Survey (abbreviated SUSS) helped illuminate the overall positive user experience of Appiness. Within the SUSS results, 18 of the 20 questions (all questions except question #9 and question #10) administered received at least 5 "Strongly Agree" answers, meaning that for an overwhelming majority of the satisfaction survey, at least half of our users gave this initial version of Appiness high marks. Furthermore, 12 out of those previous 18 singled out questions received at least 7 "Strongly Agree" answers, again reflecting the overall satisfaction and success for this introductory version of our mobile application. Lastly, question #16, concerning the level of satisfaction in the interface, scored the highest with 9 "Strongly Agree" responses, meaning that the user-requested (from user interviews) feature of a customizable experience paid dividends in our usability testing.

It is noteworthy to mention that due to a user error (forgetting to answer it), there were only 9 responses to question #10.

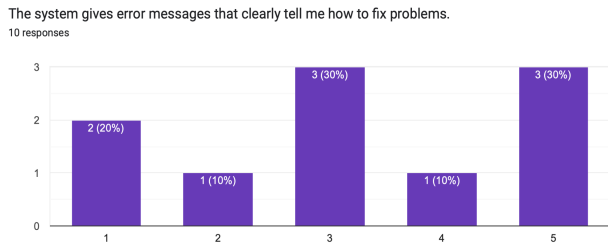

Figure 10: Results of Question 9 from SUSS

However, as seen in Figure 10, question #9 truly garnered mixed results. This question signifies the biggest drawback in the current beginning version of Appiness – there is no user feedback for mis-taps or any other type of incorrect input. As such, it is this feature that needs the most reconsideration and refinement for future iterations of our mobile application.

Discussion

After analyzing our data from our usability tests, our team discovered and recognized several themes within the data. Mainly, we, as a team were able to identify what users most liked and disliked about the current state of the application. From this, we were able to determine just how effective our initial design was in meeting our previously set (from our initial proposal) usability and user experience goals and from there relate them back to our overall project objectives. Furthermore, after our analysis was complete, we were able to identify and learn from a few notable lessons and insights within our testing. This section serves to present the aforementioned facets of our analysis and reflection.

Benefits of Appiness

Firstly, there were several positive aspects, which were directly formulated from our initial user interviews, of Appiness that resonated considerably with our participants. By far the most requested aspect from our user research was a customizable experience, as opposed to a "one-size-fits all" solution, and this manifested itself as the ability to change the theme color of the application. As evident in our results, this was the highest rated aspect of the application from our post-test survey results.

The particular reason users wanted this exact feature may be summarized by the individuality of mental health. No one person, especially within our intended user group, faces the exact same problems. They may face similar mental health challenges, like stress and anxiety, but just as no two lives are quite the same, no two mental health situations are quite the same either. The "Mood" page tracking feature also helped reinforce this individualization of the application, as it allowed users to tailor the experience to their current mood, and even have the application possibly predict moods in future iterations based on previously entered data. As such, while providing the necessary general tools to help treat mental health is a great starting point, providing further customization options so the user can personally tailor the experience to themselves served as a strong selling point and overall increased the effectiveness of the application.

Speaking of necessary general tools, the two other requested features from users in our application were daily affirmations and reflection of past positive accomplishments. Both the former and the latter were implemented two-fold, firstly on the home screen of Appiness as a small rectangular widget and secondly as its own dedicated "Accomplishments" page. This page contained three elements: an exercise suggestion, a past accomplishment, and an inspirational and/or motivational quote. For the most part, our test participants seemed to like the idea of the "Accomplishments" page. Furthermore, the ability to determine the number of push notifications/daily check-ins and affirmation helped reinforce the distinct experiences possible in Appiness. However, the requested feature of past accomplishments seemed somewhat lacking in execution.

Drawbacks of Appiness

While there was plenty of optimism and praise for its ability to have a unique identity and experience to each user, the ability to enter a new accomplishment was slightly mishandled in execution. As seen in our results, task 2, which had the user enter a new accomplishment, took the longest average time complete. One possible explanation for the lack of execution surrounding this requested component is the current user interface of the home screen. As seen in Figure 7, the button for the "Accomplishments" page is relatively cramped in comparison to the other buttons, making it difficult to recognize upon first glance. However, the length for task 2 may also be explained by the fact that it is the first true user interaction with the system and the expanded time is simply the user learning the layout of the application. In addition, redesigning the button or renaming the

page to something shorter may alleviate this issue. Overall, while this is a minor drawback, the team recognizes this deficiency as something to improve upon in future iterations.

The major drawback of Appiness that was most reported by our participants was the apparent lack of any signifiers or feedback when it came to misclicks or any other errors. As evidenced in Figure 10, this lack of communication from the system was by far the least liked aspect of Appiness. When the participant did not tap where intended, there was no signifier or feedback from the system; the screen remained exactly the same. In this instance, the gulf of evaluation is not met and evidently users became frustrated as they could tell if the mockup was actually considering their input or not. However, it is worth noting that some of this issue is partly due technological limitations within the Figma prototype; given this team's amateur knowledge and experience with Figma, it was not feasible to put such feedback into the application. But, this shortcoming in our high-fidelity prototype was amplified on the user's end. Therefore, this is a clear indicator that the next iteration of Appiness needs to provide some sort of signifier and/or feedback to help bridge the gulf of evaluation to the user.

Usability and User Experience Goals

In our initial proposal for Appiness, we sought to develop an application and user experience aimed at younger adults that centered around improving the mental health of the user and promoting more positive experiences between the user and their smartphone through various methods. With this in mind, and in conjunction with user input from our user interviews, we developed six usability goals for Appiness (see "Requirements Analysis"). After completing our usability tests and dissecting the results, this team believes these initial user experience and usability goals have been met and has a strong conviction in the purpose and potential of Appiness.

Starting with the user experience goals, every feature in Appiness, from daily affirmations to mood tracking, was meticulously designed to improve the user's mood and overall interactions with their smartphone. After seeing the results of the IBM System Usability Satisfaction survey, we were pleased to see that, for nearly the whole user experience save one minor issue and one major issue, the subjective results were overwhelmingly positive. The participants seemed to connect with the conceptual model behind Appiness and found the included features modest but effective in improving the mental health of the user. Seeing these goals achieved, especially as we are driven by harsh reminders of just what mental health may lead to, was a moment of triumph for our team.

Moving onto the usability goals, these were developed as the specific actions to complete user experience goals. Outside of the previously discussed issues with entering a new accomplishment, the users were able to complete all of our design requirements with somewhat varying but mostly consistent perceived ease of use, further backed up by the post-test Likert survey results. If this team were to hypothetically continue on this application, we fully believe the issues present in the current iteration are easily rectifiable and would further the usability and intuitiveness of Appiness.

Retrospective Analysis

Driven by the harsh realities of mental health, like the unfortunate passing of Mills Griffin, this team took an elevated level of care and attention to detail when developing Appiness. However, through the development process, there were two insights we learned from users that we had not initially considered.

Firstly, this team was surprised to learn of just how readily receptive our user group was in potentially using a self-care application. As there sometimes is a certain negative stigma associated with having mental health issues, we believe the anonymity factor of the interviews gave users more comfort and freedom to express how they truly felt. It is perhaps the fact that the application is private to one's own phone that our user group seemed accepting of our application, especially considering that they did not have to share possessing the application; they could keep their Appiness experience.

This led into our second revelation: a customizable experience for each user. When we initially began developing Appiness in its infancy, we only planned to promote positive experiences and to improve mental health. However, we did not consider the individual needs of people, thinking that our original vision would be sufficient. Again, through our user interviews and seemingly driven by our users' acceptedness of our application, users went further in requesting an experience they could tailor to themselves. This eventually led to the development of the mood tracker and the ability to change the app's main theme color. Without this invaluable insight, these innovations would most likely never have been made. Luckily, as we did implement them, these features were some of the highest testing components

of the application.

In summation, this team was motivated to give users some means of momentarily uplifting their mood via the aforementioned features, hoping that those small moments of clarity and happiness would cascade into bigger, longer-lasting moments and eventually affect the entire psyche of the user for the better. Even if a person seems happy on the outside, only that person truly knows what they are dealing with on the inside. Furthermore, it may not be easy for said individual to express their feelings, whether it be due to trauma or just not believing other people would find it that serious. In summation, as seen from our testing and surveying results, this team was able to successfully construct the user experience we originally envisioned, giving young adults the means to improve their mental health and promoting more positive and optimistic interactions with their smartphones.

CONCLUSION

Our research throughout the creation of Appiness, a mental wellness application, has demonstrated that there is a growing market for apps aimed at improving one's mental health. Our study revealed that a majority of our target demographic struggle with stress, anxiety, depression, and other mental health issues. Yet, for the most part, they do not use any sort of mental wellness app to assist them in improving their mental health. This highlights the need for accessible and effective digital resources that can be easily accessed and integrated into people's daily lives.

Our user feedback was particularly valuable in identifying key features that users find most beneficial in a mental wellness app, including daily affirmations/check-ins and reflections on positive accomplishments. Additionally, users expressed a desire for a customizable experience, as a general solution to improving everyone's mental health does not work. These findings emphasize the importance of designing mental wellness applications that prioritize user needs and preferences as their happiness is the top priority.

In order to create an optimal user experience, our study suggests that mental wellness apps should focus on simplicity, accessibility, and personalized features. Our research indicates that sophisticated software with extensive functionality may lead to cognitive overload and anxiety for users, particularly for those who are not technically proficient. Thus, creating an interface that is easy to navigate and operate is critical for reducing user error and enhancing user engagement.

As the app continues to evolve, there are several avenues for further research and development of mental wellness applications. For instance, our study suggests that including more warning and error messages to aid users in navigating the app would be beneficial in reducing frustration and helping users when they get stuck. Additionally, there may be a need for personalized interfaces that are tailored to different user groups, such as individuals with specific mental health conditions or those with different cultural backgrounds.

In conclusion, our research demonstrates that mental wellness applications like Appiness have significant potential for promoting mental wellbeing and improving the quality of life for individuals struggling with mental health issues. By prioritizing user needs and preferences, and designing interfaces that are simple, accessible, and personalized, we can create digital resources that make a positive impact on mental health.

TEAM WORK

As our team prepared to conclude research on Appiness, Evan and Ashlyn developed a usability testing guide in order to conduct our necessary usability tests. Our team then met together to discuss and approve said guide and set out to conduct usability tests. Overall, 10 usability tests were conducted. Charlie conducted 2 tests; Ashlyn conducted 3 tests; Zach conducted 3 tests; Evan conducted 2 tests. As each test was conducted, each team member would fill out a copy of the guide for that specific user and share it to our group folder. Once all tests were completed, we met again to go over our final results, debated whether or not to continue testing (which we ultimately decided against), and began deliberation on this final paper.

After that second meeting, we divided up the necessary sections of the paper and began writing. As each team member finished a section, they would notify the other team members to allow for them to proofread and suggest edits. Once all sections were completed, our team met again one last time to review the paper in its entirety, suggesting edits and improvements to increase flow and clarity of the overall paper. All in all, the contributions are as follows:

- Evan completed the "User Evaluation Results" section, "User Evaluation Discussion" section, and the "Teamwork Section" section itself.

- Zach completed the “Requirements Analysis” section and the “Prototype Design” section.
- Charlie completed the Abstract, Author Keywords, ACM Classification Keywords, and Conclusion sections.
- Ashlyn wrote about the overview, methods, tasks and measurements evaluated for the usability testing as well as compiled previous work for the introduction and user research sections.

With all sections completed and approved by each team member, the paper was then submitted. Overall, our team’s process for conducting usability tests and collating our results into this paper was a very thorough and collaborative process with each team member taking the time and effort to ensure the highest possible quality version of this final paper.

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Appendix A: Survey Questionnaire

1. What is your age?
2. What is your gender?
    a. Male
    b. Female
    c. Other
    d. I prefer not to answer
3. What ethnicity do you most identify with?
    a. American Indian or Alaska Native
    b. Asian
    c. Black or African American
    d. Native Hawaiian or Other Pacific Islander
    e. White
    f. Latino or Hispanic
4. What is your major?
5. Do you own a smartphone?
    a. Yes
    b. No
6. To what extent do you use a computer/smartphone in your daily activities?
    a. Never
    b. Rarely

    c. Sometimes
    d. Frequently
    e. Always
7. Do you currently struggle or have ever struggled with stress, depression, anxiety, and/or other mental health issues?
    a. Yes
    b. No
    c. Prefer not to say
8. If your answer to the previous question was yes, how often?
    a. Daily
    b. Weekly
    c. Monthly
    d. N/A
9. Do you use any applications to assist you with improving your mental health?
    a. Yes
    b. No
10. Would you consider using an application to assist you with your mental health?
    a. Yes
    b. No
11. How beneficial to your mental health would a daily affirmation or positive quote of the day feature be?
    a. On a scale from 1 to 5, with 1 being “Not beneficial at all” and 5 being “Very Beneficial”
12. How beneficial to your mental health would regular check-ins/interactions aimed at making you happier be?
    a. On a scale from 1 to 5, with 1 being “Not beneficial at all” and 5 being “Very Beneficial”
13. How beneficial to your mental health would tips for improving your daily mental attitude and/or mood be?
    a. On a scale from 1 to 5, with 1 being “Not beneficial at all” and 5 being “Very Beneficial”
14. How beneficial to your mental health would it be if the application reminded you of your small daily accomplishments?
    a. On a scale from 1 to 5, with 1 being “Not beneficial at all” and 5 being “Very Beneficial”
15. How beneficial to your mental health would it be if the application reminded you of your larger/broader accomplishments?
    a. On a scale from 1 to 5, with 1 being “Not beneficial at all” and 5 being “Very Beneficial”
16. Which of these features would you say is most important to you?
    a. Daily Affirmations
    b. Check-ins of Mood
    c. Mental Health Tips
    d. Remembering Positive Accomplishments
17. How many check-ins/notifications would you like to receive from the mental wellness app per day?
    a. None
    b. 1
    c. Between 1 and 5
    d. More than 5
    e. More than 10
18. Are there any additional features you might like to see within the application that were not previously mentioned?
19. Are there any additional comments or concerns you would like to express?

Appendix B: Structured Interview Questions

1. What is your age?
2. What is Your gender?
3. What ethnicity do you most identify yourself with?
4. What is your major?
5. Do you currently struggle or have ever struggled with stress, depression and/or anxiety or other mental health issues?
    a. If so, how often?

6. Do you think a mobile app could help better your mental health?
7. If you experience stress or anxiety, what are some of the sources?
8. Do you use any mental wellness applications currently, if so which ones?
9. Would you consider using an application to assist with your mental health? Why or why not?
10. What kinds of features would you like to see in a wellness application?
11. How often should a mental health application check-in/ provide assistance to its users? At what point will the app be annoying/ a nuisance? At what point is the app not doing enough?
12. What sort of daily check-ins or interactions would you like to see the application be able to do?
13. Which of these features would you like to see the most? Which should be re-worked or thrown out?
    a. Daily affirmations
    b. Check-ins of mood
    c. Occasional mental health tips
    d. Remembering positive accomplishments
14. Do you have any ideas or preferences on how you would like the application to look and feel?
15. What are general application features that you don't like?
16. Any other thoughts, comments or ideas?

Appendix C: IBM System Usability Satisfaction Questionnaire; Subjective Satisfaction Questionnaire

1. Overall, I am satisfied with how easy it is to use this system.
2. It was simple to use this system.
3. I can effectively complete my mission using this system.
4. I am able to complete my mission quickly using this system.
5. I am able to efficiently complete my mission using this system.
6. I feel comfortable using this system.
7. It was easy to learn to use this system.
8. I believe I became productive quickly using this system.
9. The system gives error messages that clearly tell me how to fix problems.
10. Whenever I make a mistake using this system, I recover easily and quickly.
11. The information (help, on-screen messages, tool-tips, etc.) provided is clear.
12. It is easy to find the information I need.
13. The information provided for the system is easy to understand.
14. The information is effective in helping me complete the tasks and scenarios.
15. The organization of information on the system screens is clear.
16. The interface of this system is pleasant.
17. I like using the interface of this system.
18. This system has all the functions and capabilities I expect it to have.
19. Overall, I am satisfied with this system.
20. I am confident about the results I produced.

For each question, users answered on a scale between 1 and 5. With 1 representing "Strongly Disagree," 2 representing "Disagree," 3 representing "Neither Agree nor Disagree," 4 representing "Agree," and 5 representing "Strongly Agree."