The Dilemma of Disclosure: Designing Interpersonal Informatics Tools for Mood Tracking

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The Dilemma of Disclosure:
Designing Interpersonal Informatics Tools for Mood Tracking

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Abstract

Mental health is a serious issue that affects people of all ages, but is especially prevalent amongst college age youth. In the 2020-2021 school year, researchers found that around 60% of college students met the criteria for at least one mental health condition, such as major depression or generalized anxiety disorder. Many digital interventions have been innovated in order to help address this issue. These range in type and functionality from teletherapy to medication tracking applications. Some of these digital interventions include social features that allow users to interact with other users, friends, family, or doctors; however, having social features in a mental health application inherently requires some form of disclosure of having a condition, creating, what we call, the dilemma of disclosure. In this thesis, we build off of Pape Traore 2023’s fitness tracking app, Sprout, to develop Sprout V2. Sprout V2 is a mood tracking mobile app that supports privacy and incentivizes use by rewarding tracking behaviors with growth of a garden visualization. By keeping users in touch with their current emotional state, the approach aims to increase emotional intelligence and broader mental health. We ran a 3 week long study with 24 Dartmouth College undergraduates. We divided users into 3 groups of 8 that had access to different features of Sprout V2. We had a control group with no social features, a group that was able to interact with strangers, and a group that was able to interact with friends. We found that user engagement was significantly higher for users in the group with friends and that they rarely misrepresented the true mood they were feeling in the app. We also devise several other design implications based on a mix of user interviews and surveys. These findings can help to inform the design of future mental health tracking apps, including further research on digital interventions to help those with serious mental illnesses.
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1. Introduction

Mental health is a major public health issue in the US, with an average lifetime risk of having at least one mental health related disorder (including anxiety, mood, impulse control, and substance abuse disorder) of 55.3% [1]. In other words, more than 1 in 2 people in the US will have a mental health related disorder over the course of their life. Mental health and wellness also has an annual economic cost of around $2.5 trillion in the US alone, which is more than the economic cost of chronic somatic diseases like cancer or diabetes [2]. These economic costs stem from direct costs to the healthcare system, but also indirect costs due to productivity loss and impact on economic growth. These costs are expected to double worldwide by 2030.

Young adults, in particular, struggle with this issue. The 2021 National Survey on Drug Use and Health found that 33.7% of 18 to 25 year olds in the US had a mental illness in the past year [3]. This is about 20% higher than those in the 26 to 49 year old age group. Young adults, especially students, also struggle with getting help for mental health related issues. Among college students with mental health issues, only 35% received professional treatment within a year while 78% used informal counseling or support [4]. Informal counseling or support includes talking with family, friends, or other non-professionals. Social support, such as talking with friends and family, has long been found to decrease risk for mental illness [5, 6]. Young adults also struggle with stigma: 45% of students agree with the statement “Most people would think less of someone who has received mental health treatment” [7]. This, creates a dilemma, especially for young adults: social support is a valuable tool for mental well being but requires some type of disclosure of a stigmatized condition. We call this tension between gaining benefits from social support and disclosure of condition the dilemma of disclosure.

We view there as being two main ways to address for this dilemma. The first is to lessen stigma and the second is to make the process of disclosure less scary (and to help people become comfortable with disclosure). We choose to focus primarily on the second means of addressing this problem. Previous work has shown that the abstraction of quantitative features can make disclosure easier and less scary [8]. Thus, we create Sprout V2, a mood tracking app that allows users to interact with one another. We use a garden motif in order to abstract data, such as frequency of tracking. Users are able to see the most recently tracked mood of everyone in their community and send messages to them in order to encourage social support. It is important to note, however, that our end goal is not to hide serious mental health issues behind a pretty facade. Our goal, instead, is to figure out what is the best way to make people more comfortable sharing serious mental health issues and gaining valuable social support.

We ran a 3 week long study with 24 users to determine design criteria for future mental health apps
and to determine the efficacy of Sprout V2. We divided users into 3 groups of 8, with each group having access to a scale of social features. Group 0 had no social features (the control), group 1 had social features with strangers, and group 2 had social features with friends. We used a mix of user interviews, focus groups, and surveys to gather results. We find that group 2 (friends) misrepresented their mood slightly more; however, they gained more benefits from the app. Group 2 reported feeling more mindful of their emotions and mood over the course of the study, tracked more moods, engaged with the app more, and reported having more fun than the other group. We also recommend that future designs should include different levels of social features as well as more customizability and data analytics.

This work is limited by several factors, the main one of which is time. It can take more than 6 months for behavior change to occur and this study ran for significantly less than 6 months [9]. Furthermore, users in the stranger group were given anonymous names to ensure users didn’t know one another, which some users reported made interactions strange since they didn’t have a name to use. We hope that design criteria learned from this experiment inform the design of future work on mental health tracking apps. Future work on this project should transition this project slowly from mood tracking towards more serious mental health topics, such as therapy and medication adherence tracking.

We begin this thesis with a literature review before discussing our intervention, Sprout V2, more in depth. We discuss the structure of our study as well as results and a discussion of those results. Finally we talk about limitations and future work to be done before concluding.
2. Related Works

In this section we review related works in the field of digital mental health interventions. We begin with an overview of mental health (specifically focusing on the US) and then transition to a discussion of digital interventions for mental health. Lastly, we discuss the inclusion, or lack thereof, of social components in these applications. We aim to situate the goals of this thesis based on gaps in the existing literature.

2.1. Mental Health

In 2015, 9.8 million US adults had a serious mental illness (a mental illness resulting in serious functional impairment) and 16.1 million adults had at least one major depressive episode (63% of which resulted in severe impairment) [10]. The recent COVID-19 pandemic exacerbated the ongoing mental health crisis. Between August 2020 and February 2021, the percent of adults that had experienced symptoms of anxiety or depression within the past week increased from 36.4% to 41.5% [11]. This rise in anxiety was largely due to pandemic related issues such as unemployment, isolation, fear, and grief, all risk factors for mental illness. These risk factors were especially amplified for at-risk and minority populations during the pandemic due to more frequent job loss and less access to health resources [12].

While all age groups struggle with mental health, the most at-risk age group are young adults [13]. In this age group risk factors like stress and pressure are amplified due to factors such as school work and transitioning to new environments. These risk factors lead to a decrease in ability to learn, which amplifies anxiety and other risk factors in a reinforcing feedback loop [14]. For example, in the US 18-34 year olds are 3.5 times as likely as 65+ year olds to develop anxiety disorders [1]. In a Spring 2022 survey of college students of mental well-being over the past year, 51.9% reported feeling lonely, 27.6% reported having suicidal ideations, 10.9% reported purposely harming themselves, and 2.6% reported at least one suicide attempt [15]. The 2021 Healthy Minds Survey found that 41% of students screened positive for depression and 34% screened positive for anxiety [7]. Only 38% of students have a positive mental health as measured using the “Flourishing Scale” and 32% of students have an apparent mental health problem [4].

Despite high levels of depression and anxiety, only about 30% of students report receiving counseling or therapy from a health professional in the past year [4]. Informal help-seeking is a significantly more common way of students receiving counseling or support services, with about 78% of students choosing to go this route. Amongst students receiving informal services, the most common people they received support from were friends, family members, and significant others. Social support is an
extremely beneficial resource, with strong associations with good mental well-being [5, 6].

For a lot of students stigma plays a part in not reaching out for help. 45% of students agree with the statement “Most people would think less of someone who has received mental health treatment” (public stigma) while only 6% of students agree with the statement “I would think less of someone who has received mental health treatment” (personal stigma) [7]. It’s important to note that the way someone views themself getting help (self-stigma) can be different than the way that they view other people receiving help (personal stigma). While personal stigma is very significantly and negatively associated with seeking help, perceived public stigma is not significantly associated with help seeking behavior [16]. Personal stigma was the highest amongst people that are young, male, Asian, international, religious, or poor, which often accounted for reasons why people from these demographics did not seek help.

However, stigma only accounts for a portion of the untreated mental health crises [17]. In the 2021 Healthy Minds survey the most commonly cited reason for not seeking help was tied between lack of time to get help and the perception that the problem will resolve itself without the need for help. Students especially believe that stress and anxiety is normal in college/graduate school and/or that their problem is not serious enough for them to seek help [7]. It’s also important to acknowledge that identity is also a large part of why groups of students do not seek help. Cultural competence of mental health services is cited as an important reason for not receiving services and issues related to sexual identity were cited as an important reason for not receiving services by 23% of non-heterosexual students [17].

There thus exists a tension between disclosing a condition and receiving social support. While social support is extremely beneficial, it almost always requires some disclosure of a condition; however, for stigmatized conditions, especially mental health, disclosure is much more difficult and often does not happen. This creates, what we call, the dilemma of disclosure. There is also a reinforcing feedback loop involved in this process. Not disclosing a condition can lead to further feelings of isolation, which leads to less of a chance of disclosure and so on. We hope to address this dilemma by making it easier to disclose conditions by making the user of our intervention feel more comfortable doing so. We choose to address this dilemma this way since the alternative, lessening stigma, would require a broader culture change.

2.2. Digital Interventions

Traditional mental health services include therapists/psychologists, counseling, and psychotherapeutic drugs [18]; however, these services are not always easily accessible due to socioeconomic, cultural, and psychotherapeutic barriers. This is especially true for people who are part of a marginalized community [19].

Digital mental health interventions offer potential treatment while simultaneously avoiding barriers that traditional mental health services encounter [20–22]. Digital mental health services range in both
function and service. Some offer synchronous services (teletherapy, streamed meditation, etc.) while others offer asynchronous services (self-tracking systems, guided yoga/meditation, etc.). These digital interventions can be effective in improving students’ depression, anxiety, and stress [23, 24]. Similar digital interventions have shown to have effects for changing behavior regarding sustainable, fitness, and studying habits [25–27].

An example of a digital mental health app is Go&Grow [28]. Go&Grow is an app targeted towards caregivers of people with dementia. Caregivers experience higher rates of stress, isolation, and poor mental and physical health relative to non-caregivers. Caregivers on the app choose a seed to grow each week and foster the seeds growth by completing various outdoor workouts and activities. If the seed is properly grown the plant is added to their garden. Caregivers can also visit other caregivers’ gardens and interact with them. In a 6-week study with 18 caregivers, caregivers had a statistically significant increase in management of distress and found an increased sense of belonging and community amongst other caregivers. Go&Grow also is more accessible than traditional mental health services. Caregivers said that it was easy to fit the app into their schedule, as it was always available and there was not a specific time where they had to use it.

Other forms of digital intervention include using biometric data as a means of managing mental health. For example, the StudentLife Study at Dartmouth College used passive and automatic smartphone sensing data (sleep, conversations, physical activity, eating habits, time spent outdoors, etc.) to track the mental well-being of 48 students over the course of a 10 week term [29]. They found strong correlations between the sensed data and well-being measures related to depression, stress, and loneliness. Digital interventions use data like this to communicate with health advisors and provide interventions when people are most at-risk for self harm or suicide [30].

These digital interventions use a method called self-tracking in order to monitor one’s mental well-being. Self-tracking is the practice of systematically tracking information about their life (diet, exercise, sleep, etc.), usually by using a smartphone. This tracking can occur passively (when a smartphone measures data without user involvement) or actively (manually entering data). The idea behind self-tracking is that by discovering behavioral patterns, we can figure out points of intervention to change unhealthy behavior or encourage more healthy behaviors.

2.3. Social and Community Involvement

Digital mental health interventions differ in many ways, but one of particular note for this thesis is the level of social and community involvement. Go&Grow, for example, integrates a high level of social interaction and community by allowing caretakers to view other caretakers’ gardens. On the other hand, the aforementioned apps using biometric data have a significantly lower level of social involvement since users aren’t interacting with one another.

Research has shown that there exists a high correlation between feelings such as loneliness and isolation and depression [31]. The inverse, feeling connected within one’s community being associated
with not feeling depressed, is also true. While this phenomenon is well-documented, digital health interventions rarely choose to integrate quality social connections as a core part of their user experience. As a result, not much research has been done in determining if social connectedness has positive effects in the digital realm or if these effects solely exist in non-digital settings.

Of the research that has been done on digital social connections, results indicate that digital social connectedness results in a decrease in depression. In a review of existing literature, Dewa et al. found that digital quality social connections amongst young people appeared to improve depression, with a 26% weighted mean decrease in depression [32, 33]. Furthermore, very little work on digital mental health interventions focuses on creating design criteria via an experiment, which we aim to do in this study.

Some digital mental health applications incorporate social components to them, but fail to justify the importance of that feature. Go&Grow, for example, integrates social connectedness among caregivers, but doesn’t run a trial without this feature to determine its relative importance to other features in the app. The authors, however, do write that the app “highlighted caregivers’ desires to better connect with caregivers” based on qualitative feedback [28]. This indicates that the inclusion of the social feature probably had some effect on the efficacy of the app, however we are unable to quantify it or make a convincing argument without more evidence.

Existing literature that aims to address whether or not social connectedness in digital mental health interventions increases the effectiveness of the digital intervention usually uses two distinct digital applications (one with a social component and one without) and then looks at the difference [34, 35]. This leads to the introduction of many confounding variables, making it difficult to determine whether or not the social factor is responsible for positive results (and if so how much of the results can be attributed to it). For example, Ellis et al. aimed to investigate the relative efficacy of an individual online cognitive behavioral therapy (CBT) program (MoodGYM) versus an online support group (MoodGarden) [34]. While they found that people generally enjoyed MoodGarden more than MoodGYM (and also felt that MoodGarden helped them more), it’s impossible to solely attribute these results to social connectedness since CBT and support groups are inherently different forms of therapy. The aim of this article, and most articles similar to it, is to analyze general trends instead of determining specific design criteria.

Integration of social features into digital mental health interventions also poses many challenges. In one study, young adults expressed worries about how people might spread “negative energy” towards others on the app and that talking about depressing subjects could make people feel more depressed [35]. Others worried that nefarious users could potentially use the app to try to push people over the edge. Designers also have to ensure that privacy concerns are adequately addressed. Especially with mental health, a stigmatized condition, people are worried that their condition might be traced back to them or may not necessarily want certain people to know of their condition.
3. Digital Intervention: Sprout V2

We built our digital intervention, Sprout V2, based off of Sow Traore 2023’s Sprout application (henceforth referred to as Sprout V1) [8]. Sprout V1 was an iPhone application developed for the purpose of self-tracking fitness data. A user would choose two pieces of fitness data to track and would receive droplets or seeds to grow their tree or flowers respectively. Droplets and seeds were awarded based on how close users were to achieving their goals.

We modified this app by adding in mood tracking functionality and changing aspects of the community view. In this section, we discuss changes we made to the app, namely onboarding, mood tracking, community, and garden resets.

Information on how to access the codebase can be found in Appendix A.1.

3.1. Onboarding

We altered the onboarding experience depending on which group the user is in. All users were able to customize the appearance of their tree and flower during onboarding. They were not able to change their choices later. At the end of onboarding, users in group 0 and 1 were prompted to choose a name for their garden that contained no identifying information in it. Users in group 2, on the other hand, were prompted to enter their preferred name.

3.2. Mood Tracking

Our main addition to the app was mood tracking. We choose mood tracking because it is one part of the much broader topic of mental health. Also, while people are hesitant to reveal their mood, there is less at stake in revealing this information relative to more serious mental health information such as medication adherence. Thus, mood tracking serves as a good starting point for delving into serious mental illness tracking later: there is still this dilemma of disclosure, but there is also less at stake in case we were to improperly design a feature. Note that we do not mean to proxy someone’s mental health with their mood, although we recognize that mood does contribute towards someone’s general well-being. Furthermore, mood tracking increases emotional intelligence, which in turn helps with mental well-being [36]. Thus, there is also some positive externality for participants.

To implement mood tracking, we added in a floating action button (FAB) on the screen (see Figure
3.2a). Initially, the FAB displays an empty mood, indicating to the user that they should track their mood. Upon pressing the FAB, users are brought to a screen that allows them to track their mood (see Figure 3.2b). Users are given five different icons corresponding to the following moods: upset, sad, meh, content, and happy (see Figure 3.1). After selecting a mood, the user is then brought back to the page they were on before pressing the FAB. The FAB is then populated with the mood that the user just tracked (see Figure 3.2c), as is the mood tracking view (see Figure 3.2d).

![Mood Icons](image)

(a) Upset  (b) Sad  (c) Meh  (d) Content  (e) Happy

Figure 3.1.: Moods that the users had options to track.

To incentive users to track their mood, users were given one droplet and one seed upon tracking their mood for the first time within one calendar hour (e.g. 3:00-3:59PM or 4:00-4:59PM). While users only received rewards for the first time tracked within an hour, they were still able to update their mood throughout that hour as many times as they would like if something happened to make their mood change. After a user tracked their mood for the first time in an hour, a notification was sent out to other users in their group (except for group 0) saying “[user] just logged a(n) [mood]”. For group 1, the user name was the name of their garden, whereas, for group 2 it was the actual name of the user. We implemented this feature to inspire others in a group to track when others track.

We used a Firebase collection to store the moods that an individual tracked. Every mood corresponded to a numerical ranking, which was stored in a document along with the user’s id, name, garden name, group number and the date and hour it was logged for. We wrote a google cloud function that triggered every time a new mood was created in the database and would send a notification (as mentioned before) to other users in the group using Firebase Cloud Messaging (FCM). We also added in a collection for statistics (e.g. droplets and seeds). In Sprout V1, this data was previously stored in a local SQL Lite database.

Users were able to view their mood history in the history view. If they had access to a community, they also would be able to view their community’s history as well. Moods were sorted from the most recent to least recent and were all tagged with the time and date the mood was logged with as well as who logged it (either garden name or user name depending on the group) for the community history view. See Figure 3.3 for what these screens looked like.
Figure 3.2.: Screenshots of how the garden and mood views change before and after tracking within an hour. Screens b and d appear after pressing the FAB on screens a and c respectively.
Figure 3.3.: Personal and community mood history. Each entry is labeled with the corresponding date, hour, and garden name.
3.3. Community

We also changed the community page (keep in mind that group 0 did not have a community page). Namely, we added a mood icon representing a user’s most recently logged mood next to their garden (See Figure 3.4). This way users in a community could see a user’s most recently tracked mood (a proxy for their current mood) and could reach out to them regarding their mood using the in-app messaging. We also made it that, for group 2, instead of displaying the garden name underneath the garden, the user’s preferred name was shown. Like before, users were able to send messages to the community or individuals. They could also choose if these messages were anonymous messages or not.

![Figure 3.4.: The community view screen. Each user’s garden is labeled with their most recently tracked mood.](image)

3.4. Garden Resets

In Sprout V1, each user’s garden would reset at the beginning of the next day (12:01AM), meaning that their tree would reset to its original size and their flowers would be cleared. Users in that experiment did not like that their progress only lasted for that day and would have preferred to view a garden that
captured more long term progress. Thus, we decided that in our experiment each user’s garden would reset once a week instead of once per day. To accomplish this, we used a cron scheduler to run a google cloud function once a week to reset everyone’s garden (reset tree size to the original and don’t copy over flowers to the next day). On other days of the week we used a different cron scheduler and google cloud function to simply copy over everyone’s information to the next day. We quickly encountered an issue where we would have over 500 documents (trees and flowers) to copy over to the next day. Using a Firestore batch write, you can only perform a maximum of 500 operations on a collection. We would thus encounter errors where only portions of data would be copied over to the next day. To fix this issue, we stopped the google cloud function and manually copied data over to the next day. We used Firefoo, a GUI for Firestore to download the previous days garden items as a json and ran a Python script to generate a new json file with all of the previous day’s dates replaced with that day’s dates. The Python script can be found in Appendix A.2. Then we would upload this new json file to Firestore using Firefoo. We did this at 12:01AM every night (except for the weekly total reset night) to ensure a smooth user experience.
4. Methods and Study Design

In this section, we discuss the process of conducting our experiment from start (recruitment) to finish (offboarding) and the associated methodologies.

4.1. Recruitment

We recruited participants at Dartmouth College by placing flyers across campus. The flyer can be found in Appendix B.1. We ensured to place the flyers into highly trafficked areas, such as dining locations, classroom buildings, the library, and residence halls. The flyer described the study, contained requirements of participation, and had a QR code on it that linked to an interest form. The interest form asked about demographic information (race, age, and gender identity), whether or not the person had self-tracked before, and how interested the person was in self-tracking individually, with strangers, and with friends. We also asked participants whether or not they had participated in Sow Traore 2023’s experiment. The full form can be found in Appendix B.2.

We posted the flyers for five days and received 62 responses before we closed the form at the end of day 5. The vast majority of respondents (∼ 95%) were undergraduate students, with the remaining respondents being Faculty/Staff. The average age of respondents was 21.6 years old. 31.6% of respondents identified as male (used exclusively he/him pronouns), 56.5% of respondents identified as female (used exclusively she/her pronouns), and 12.9% of participants identified as non binary, gender non-conforming, or gender-fluid (used a mix of they/them pronouns and other pronouns, used only they/them pronouns, or used any pronouns).

4.2. Participants

Of the 62 respondents to the recruiting survey, 24 were selected to participate in the experiment. 2 of the selected participants ended up dropping out of the experiment prior to the end of onboarding. Since they dropped out prior to the experiment beginning, we replaced them quickly with 2 other participants who completed onboarding before the start of the experiment. The 24 participants were uniformly assigned to 3 different groups for the duration of the study: group 0, group 1, and group 2. Each group contained 8 participants. Conditions for each group are discussed more in Table 4.1. In short, group 0 was the control group and had no social features, group 1 contained social features with strangers, and group 2 consisted of social features with friends.
Participants were randomly selected from respondents to the screening survey, with the exception of group 2. For the purpose of testing our hypothesis, we needed to recruit 8 participants that were all already friends with each other, which would have been unlikely to happen naturally by random selection. The remaining participants were assigned to either group 0 or group 1 depending on their interest in tracking solo versus with a group. We did this so that we ensured users in group 1 felt comfortable with others seeing their tracked data and to not violate their privacy.

All of the selected participants were Dartmouth undergraduates, which was done purposely since college students are most at risk for mental health issues [13]. 70.8% of participants identified as female and 29.2% identified as male. The average age of participants was 21.1 years old. Participants were also assigned an anonymous participant number to track comments and data throughout the study. Detailed demographic information can be found in Table 4.2.
<table>
<thead>
<tr>
<th>Group Number</th>
<th>Conditions</th>
</tr>
</thead>
</table>
| 0            | • The individual (control) group  
               • No access to a community page  
               • Did not receive push notifications when others in their community logged their mood |
| 1            | • The stranger group  
               • Had access to a community page  
               • Gardens in the community page was labeled with a chosen garden name (from onboarding) that contained no identifying information about them  
                 – This was done in case users in this group knew each other in real life that they would still be strangers in the app  
               • Users received push notifications when others in their community logged their mood |
| 2            | • The friend group  
               • Had access to a community page  
               • Gardens in the community page was labeled with each user’s preferred first name  
               • Users received push notifications when others in their community logged their mood  
               • Users were friends with each other prior to the start of the study |

Table 4.1.: Description of each group number and their corresponding experimental conditions.
<table>
<thead>
<tr>
<th>Participant Number</th>
<th>Group</th>
<th>Age (yrs)</th>
<th>Gender</th>
<th>Race</th>
</tr>
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<tr>
<td>1</td>
<td>0</td>
<td>21</td>
<td>F</td>
<td>Caucasian/White</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>22</td>
<td>M</td>
<td>African/Black, Hispanic/Latinx</td>
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<tr>
<td>3</td>
<td>0</td>
<td>20</td>
<td>M</td>
<td>Asian, Caucasian/White</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>19</td>
<td>F</td>
<td>Asian</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>22</td>
<td>F</td>
<td>Caucasian/White</td>
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<td>0</td>
<td>21</td>
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<td>Asian</td>
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<tr>
<td>24</td>
<td>2</td>
<td>22</td>
<td>M</td>
<td>Caucasian/White</td>
</tr>
</tbody>
</table>

Table 4.2: Demographic information for each participant collected at the beginning of the study. M indicates male and F indicates female.
4.3. Experimental Design

We ran our experiment for 3 weeks in order to get a decent understanding of the user experience. The study ran from April 21st to May 11th 2023 (21 days). Garden resets occurred on April 28th and May 4th at midnight. Participants that successfully completed all parts of the study were given a $100 gift card as compensation. In this subsection, we discuss our experimental design. Namely, we discuss how we structured onboarding, the actual use period of the app, and offboarding.

4.3.1. Onboarding

Selected participants were first asked to complete a confirmation survey, which asked them to confirm their participation in the study and detailed exactly what participation entailed (see Appendix B.3). We also collected information from the participants about what iOS version and iPhone type they had. Participants were asked to ensure that their iOS version was at least 15.0.0.

After we confirmed participation, we asked participants to (1) complete an onboarding survey, (2) review their group’s user guide and record themselves answering short answer interview questions, and (3) meet with me in person to download the Sprout V2 app.

The onboarding survey asked participants questions about their current health, how satisfied they were with their health, and how motivated/hopeful they were to change the status of their health (see Appendix C.1). For the survey, we defined health as both mental and physical health. We also asked questions regarding anxiety and depression adapted from PROMIS 29 Profile v2.0 [37]. Every user was given the same onboarding survey regardless of their group.

Users were also given a user guide (see Appendix C.2). The guides contained a brief introduction as well as screenshots of different screens explaining how different buttons and icons worked. The guides were customized for each group to inform the user of their specific features. After reviewing the guide, users were asked to record themselves answering a series of questions (see Appendix C.3). These questions largely focused on their goals and motivations for joining the study (and wanting to self track) and if they had ever tracked information with others (or in some social way). Users in groups 1 and 2 were also asked to comment on their initial thoughts about the community aspect of Sprout V2. All interviews were transcribed using otter.ai.

Lastly, users were asked to attend an in person meeting with me to download the app. During this meeting, users downloaded Testflight and then downloaded Sprout V2. I showed them how to use the app and users tracked one mood in order to get a feel of how the reward system worked. We asked users not to use the app until the official start of the study, but, just in case they did, everything was reset to the initial state prior to the study beginning. Users were given the opportunity to ask any questions they had about how to use the app.
4.3.2. During

Users were asked to try to track their mood at least once per day over the course of the study and were welcome to track more than once if they would like to. We checked in on users at the end of each week (the day that their garden would reset) to see if they had any issues with the app and if they needed anything.

4.3.3. Offboarding

For offboarding, participants were asked to complete a survey and either a focus group or an individual interview.

The offboarding survey (see Appendix D.1) included all of the same questions as the onboarding survey (discussed in Section 4.3.1) and several more. We also wanted to learn more about how users feel of social connection changed. This led to us to use the Lee & Robbins 1995 social connectedness and social assurance scales to measure how connected users felt to their community (community in this case refers to a user’s general community and not just their community in Sprout V2) [38]. We also measured user engagement with the app. We did so using a mix of metrics, including the user engagement survey (UES) short form, the unified theory of acceptance and use of technology (UTAUT), and general app response questions we determined ourselves [39, 40].

We also conducted 4 focus groups and 2 one on one interviews for the second portion of offboarding. We transcribed these using otter.ai for analysis. We ensured that focus groups contained a mix of participants from each experimental group. We asked questions related to the app in general, social components, and the in-app experience. The focus group/interview guide can be found in Appendix D.2.
5. Results and Discussion

In this section we discuss the results of our 3 week experiment. We categorize our results into three main categories: (1) dilemma of disclosure results, (2) interpersonal engagement, and (3) individual engagement. We do, however, recognize that there is some overlap between these categories. To see what a week looked like in from a user’s point of view during the study see Appendix E.1.

We analyzed our results using Jupyter notebooks (see Appendix A.3).

5.1. Dilemma of Disclosure

5.1.1. Confirmation of the Dilemma of Disclosure

In our offboarding survey and during focus groups, we asked users about if they ever misrepresented their mood for any reason. The purpose behind this was to see if our app encouraged users to share their mood honestly with others and overcome this dilemma of disclosure. We found that, for the most part, users accurately tracked the mood they were feeling at that time. The average for all groups was that they at most “Rarely” misrepresented their mood (the only option lower than that being “Never”). Group 0 (the control) all reported that they always tracked their mood honestly, which fits into our expectations: if only you are viewing your mood what incentive is there to lie? The average response for each group can be found in Figure 5.1. We found that, while all groups were largely honest with their mood, group 2 was the least honest with their mood (but only by very little).

Misrepresentation of mood widely varied by user. Some users felt that they could be brutally honest with everyone in their group: “I felt no pressure [to misrepresent my mood]. I loved the anonymous part. That was like my favorite part. Because I mean, I used to like, I don’t know, anonymously shit post on the internet… like on Wiki pages… And you don’t want to know them. You’re just talking about like tracking our moods together.” (P13, Group 1). Another user in group 1 had similar thoughts: “I think the fact I was more honest was probably because I was in an anonymous group because I didn’t know anyone in the group. So it was like, Oh, I can log it. Like no one knows who I am” (P11, Group 1). Some users acknowledged that posting a sad or upset mood could “kill the vibe”, but didn’t care since everyone was strangers: “And I was like, I’m ruining the vibe like if I felt like upset or something. But I didn’t know them. So I didn’t really care. So I was like, whatever.” (P12, Group 1). However, some users did not log sad moods because they did not want to be a buzz kill: “I never logged logged the worst mood you could… no one in my group really ever logged sad moods… it would kill the vibe if I was sad” (P16, Group 1).
Group 2, on the other hand, misrepresented moods in both directions. While users still misrepresented sad moods, they sometimes also felt bad about being happy while others were sad: “Six people were logging like upset moods, you don’t be like, I’m feeling great today” (P20, Group 2). Users in this group didn’t usually misrepresent sad moods for fear of being a buzzkill, but instead it depended on whether or not they wanted other’s to reach out to them since users in this group usually reached out (P24, Group 2). Most users in this group felt totally comfortable with their friends knowing how they felt: “I didn’t feel any like pressure to lie about my mood, but like, given our group was a group of like very close friends. I don’t care if they like know I’m sad. So yeah.” (P22, Group 2).

Group 2 also tracked many more happy moods by proportion than any other group (see Figure 5.2 and Figure E.5). This could be due to variety of factors. Group 2 could just have been happier than other groups on average (onboarding and offboarding surveys reported lower anxiety and depression metrics relative to other groups). Another explanation could be that seeing other’s moods made users track a slightly higher mood: “I would say like, if people were more generally happy, like, sometimes I feel like I’d be like, oh, I guess... I’m like, maybe like one mood about what I actually am. But it was never like, Oh, I’m super happy. Like, even if I’m sad. So it wasn’t like a crazy factor. But like, I think it definitely did exist” (P19, Group 2). Another alternative is that users felt happier when on the app because they were talking to their friends or that they used the app when physically together (which they were likely happier during). Lastly, it’s possible that sad moods did not persist in group 2 for as long since users reached out to one another when they saw they were feeling sad.
Users that Tracked With Friends Felt More Mindful of Their Emotions/Mood

Users of the app also felt that they were more mindful of their emotions and mood. This effect was felt universally across all groups (with an average response for agreement being between neutral and agree), however it was seen most strongly in group 2 (see Figure 5.3). One potential reason for this could be that seeing their friends moods forced them to think about their mood in the context of their friends’ moods. We see this when users in group 2 acknowledged that they didn’t want to log a happy mood when everyone else was sad: they would have to recognize everyone else’s mood in the context of their own and how their mood could impact others. This means that they would be spending more time thinking about their mood than the other two groups.

Throughout focus groups, users reiterated how the app made them think about their emotions more: “Yeah, I think for me, it’s definitely been more mindful of my emotions... So I think it did give me an opportunity to reflect a little bit more than I like, normally would have.” (P8, Group 0). Another user had a similar reason: “I think just having to choose from those options just kind of forces you to think about how you’re actually feeling at that moment. And like, you have to think about it for a few seconds before you select your mood for sure.” (P22, Group 2). Users largely said that they didn’t usually consciously think about their mood on a day to day basis: “I feel like it does remind you to like think more about your moods, which I feel like normally I wasn’t doing.” (P7, Group 0). Some users commented on how it made them think of their overall mood pattern more: “I just realized, like, how often like I’m in a good mood” (P21, Group 2). Sprout V2 made people deviate from their usual behavior and consciously...
consider their mood more often.

### 5.1.3. Users that Tracked with Friends Felt More Inclined to Reach Out to Others

Group 2 had 4 substantial interactions discussing people within their group’s moods. Group 1 on the other hand had no substantial interactions on this topic, but did have one user (P10) reach out to two users about their mood (sadly neither of these received a response).

Below are two examples of group 2’s interactions when users logged sad moods:

**P24** you good buddy?

**P24** we’re all with you

**P24:** ThNks all

...  

**P23:** Prayers up!

Another example is as follows:

**P21** why are you meh are you ok?

**P21:** guys it’s just how I feel ok

**P21:** I promise I’m good
We want to help you feel happy. This is what the community is for!

On the other hand, group 1’s interactions were more one sided (note that $A \rightarrow B$ represents a direct message sent from person A to person B):

- **P10 $\rightarrow$ P16**: You okay @[P16]?
- **P10 $\rightarrow$ P11**: Hope your day improves!!
- **P10**: y’all alive?

Another interesting aspect is that users in group 2 would check in on others using community messages, whereas users in group 1 tended to check in using private messaging to one another. This is likely due to the fact that everyone in group 2 felt comfortable communicating and discussing mood publicly. One user in group 2 commented “I mean, for us, it’s like, if you want to send an individual message, you’re just going to text them like it’s a pain, it would be like a pain in the ass, like sending an individual message on it, that doesn’t really make sense.” (P22, Group 2). Users in group 1 commented that they felt weird about sending messages to strangers about their mood since they didn’t know if they wanted to be reached out to or not (P13, P14, Group 1).

### 5.1.4. Users that Tracked with Friends Reported Getting More Out of Their Experience

Users that tracked with friends also reported that they got more out of their experience than other groups. Users in group 2, on average, answered the most favorably when asked to respond to “My experience with the app was rewarding”, “Using the app was worthwhile”, and “I found the app useful in my daily life” followed by group 1 and then group 0 (see Figures 5.4, 5.5, and 5.6 respectfully). Group 2 was also the only group to, on average, slightly agree with the statement that “the app helped me to pursue my health goals” (see Figure E.6). It is thus no surprise that group 2 was the group that responded most likely to continue using the app (see Figure E.7).
Figure 5.4.: Average response from users regarding how rewarding they found their experience by group. Data gathered from the offboarding survey.

Figure 5.5.: Average response from users regarding how worthwhile they found their experience by group. Data gathered from the offboarding survey.
Figure 5.6.: Average response from users regarding how useful they found the app by group. Data gathered from the offboarding survey.
5.2. Interpersonal Engagement

5.2.1. Users with Social Features Engaged With Sprout V2 More

We found that groups that had access to social features engaged with the app more, but that overall engagement with the app dropped off after the first week or so (see Table E.1 for user engagement dynamics). We proxied engagement by collecting screen time data from each user’s phone during offboarding. Since Apple screen time is only displayed for 3 weeks, we sadly do not have data for days 0 and 1. Also, Apple screen time data was not always accurate, so on days where screen time was suspiciously low (e.g. spending only 8 minutes on their phone over the whole day) we did not collect data. Figure 5.7 shows the screen time by group per day. We only show data for days where we had at least 4 users in a group report reliable screen time data. We see that group 2 spent a much larger amount of time on the app than any other group at the beginning. This was usually followed by group 1.

![Average Daily Interaction By Group](image)

We see a similar trend with how many messages each group sent. Figure 5.8 shows the number of community messages each group sent over the course of the study. Group 2 sent over 40 times more community messages over the course of the study than group 1 did. Group 2 also sent more direct messages than group 1, but, as a whole, there are many less direct messages than community ones (which is why we primarily focus on community messages). Table E.1 contains information about both community and direct messages by week per group.

The community messages follow a similar pattern to screen time: significant engagement at the be-
Figure 5.8.: Messages sent per group by day. Messages are demarcated by whether or not the messages were relevant to mood tracking or Sprout V2.

ginning followed by drop off after the first week. This is likely due to the app’s novelty fading off as it becomes less new and exciting. We also see that most messages in group 2 were not relevant to mood tracking. Users seemed to send one off topic message, usually a joke or a humorous comment, and then other users would join into the conversation. One example of this type of conversation is as follows:

\[
P20 \quad \text{just logged a(n) gassy mood}
\]

\[
P20 \quad \text{just logged a(n) poopy mood}
\]

\[
P20 \quad \text{just logged a(n) diahorrea ridden mood}
\]

\[
\ldots
\]

\[
P18 \quad \text{just logged a(n) drunk mood}
\]

Users sent messages like this, and the vast majority of messages, anonymously through the app. In the above dialogue users are making a joke about the notifications that the app sends to users when someone in their community logs a mood.

5.2.2. Users that Tracked with Friends Tracked More Than Other Groups

Despite group 2 spending considerable amounts of time off topic in the app, they did track their mood much more than other groups. Figure 5.9 shows the total number of moods tracked over the course of the study. We see that group 2 tracked approximately 25% more moods than the next highest tracking group. Group 2 also reported that they felt more motivated to track than other groups did, whereas groups 0 and 1 reported roughly the same motivation to track (see Figure E.12).

We also found that pretty much everyone in social conditions reported tracking when they noticed
that other users tracked (users got a notification when someone in their community tracked a mood, except for group 0). Users really liked this form of positive social pressure to motivate and remind them to track, with one user saying they wished they had it in other tracking apps: “I have critical anxiety and I tried to use headspace to track it. And I just wouldn’t ever remember. So like, I really liked that there were anonymous people who would remind me to do it when they did it. And I think that’s something like that, like for, like anxiety, for example, like how that would apply to me would be like, really cool. Like, I would really like that. And then I would be maybe more motivated to use it because I don’t really use like, I’m not good at like, using tracking” (P16, Group 1). It is thus surprising that group 1 did not track that many more moods relative to group 2 since they had the same notification system.

One possibility behind this is that they did not feel the same competition to track more since there were less stakes due to not knowing one another. Users in group 2 frequently commented in focus groups that they viewed their tree and flower growth as a competition: “there was some competition in the group as to like, tree size, or like, how many flowers you had in your garden, things like that” (P16, Group 2). P16, however, also commented that the actual moods they tracked were not competitive in nature, but that the quantity was; no one was competing to be happier than the others, but people wanted to track the most to have the best garden. Users in group 2 also commented on how P20 would stockpile seeds and droplets before the garden reset so that they could always have the biggest tree and most flowers. In group 1, however, users did not really view the experience as competitive: “I don’t think in group one, we were competitive or collaborative, collaborative in the sense of like, we would remind each other to launch and not really anything else” (P12, Group 1). A reason for this might be that they were not as engaged with their community: “I wasn’t really tapped into the community” (P10, Group 1).
5.2.3. Users that Tracked with Friends Enjoyed their Experience More

While we previously discussed how group 2 reported the most benefits from their experience (see Section 5.1.4), they also reported enjoying their experience using the app the most. Users in group 2 (followed by users in group 1 and then group 0) felt more absorbed in the app, felt that time slipped away more, had more fun, and were more entertained relative to other groups (see Figures E.8, E.9, E.10, and E.11 respectively). Again, it is thus not surprising that users in group 2 were the most likely to report that they would continue using the app if given the opportunity (see Figure E.7).

5.3. Individual Engagement

5.3.1. Users felt that their Garden did not Represent them

Across all groups, users reported that they felt that their garden wasn’t unique to them. This is a fair assessment: if two users chose the same tree and flower, then their gardens would look identical (aside from the size of the tree and the number of flowers). Users also did not like how their garden looked the same every week: “My garden was kind of like always the same color” (P21, Group 2). Users wanted something more from their experience aside from just the garden: “I almost wish there was more things besides just the flowers and the growing tree. Like, it would have been cool if maybe you could save up your seeds and like five seeds of the bush, or like 10 seeds would be like a river. And then you could like, make more of like an actual, you know, scene” (P1, Group 0). One user commented how it would have been nice “if the flowers are different colors based on emotion” (P13, Group 1). For the large part, users felt bored simply repeating their actions from the week before to achieve the same result, leading to a loss of motivation and engagement. We see this especially after the first garden reset.

5.3.2. Impermanent Features were Looked at Unfavorably

Every week, users’ gardens would reset (the tree would revert to its original size and the flowers would get cleared) so that they could have space to regrow their tree and plant more flowers for the next week. Users largely disliked that this happened and had exciting ideas on how to change it: “I have such a vision… And like, maybe instead of like a garden, it’s like, you get a new tree. And like, maybe it maxes out size. But then you have a forest that you can add it to like, things like that, I think would be fun.” (P18, Group 2). Other users echoed this idea throughout focus groups, and, interestingly enough, also called it a “forest”: “I wish you could build a forest” (P16, Group 1) and “but then it like branches out to a forest. So you can kind of scroll on to where the forest is, I think kind of having like, being able to see like the forest…” (P11, Group 1). The concept of a “forest” not only allows users to add more to the garden, but also allows users to reflect on previous weeks’ mood tracking history. The takeaway from this is to not limit what users can do (e.g. having a reset or a max size for the tree), but instead to give them other options when they’ve exhausted existing ones.
5.3.3. Users Wanted more Insights from their History Tab

Across all groups, users wanted more insights on their mood tracking history. Users wanted this because they wanted something to work towards. Namely, they wanted to work on improving their mood: “I like seeing the trends, [it] makes me motivated to change something” (P4, Group 0). However, the simple log of mood history that we had implemented did not provide, as one user puts it, “interpretable data” (P5, Group 0). P5 also commented that “trends in my mood weren’t visible”. They were not the only one to say this: “there is no visualization of my data across the week or day, so it feels like the data I’m giving the app is lost to me and I have no way of looking at trends/patterns” remarked P12 (group 1) in their offboarding survey. Future designers should consider implementing time series graphs or some other method of visualization. Furthermore, providing insights on their mood (e.g. every Tuesday your mood is lower than average) provides attainable goals to work towards and could increase user engagement.

5.3.4. Users had Mixed Feelings on the Granularity of Moods

Users also had mixed opinions on the variety of moods they had to choose from (see Figure 3.1 for the available options). Some users wanted the ability to add a comment to the mood they tracked, recommending a “journal component” (P5, Group 0). Other users wanted more options for moods to choose from. One wanted it such that you chose a broad mood (like happy or sad) and then were presented with more specific options (e.g. if you chose happy you’d be given options such as delighted, elated, excited, etc.): “you should look up a picture of the emotion wheel, you like you pick your main emotion out of the four. Yeah, got more specific that” (P13, Group 1). Other users really enjoyed the simplicity that came with distilling their mood into one of five options: “I kind of liked the simplification… It forced me to just kind of like, take a step back, if I was, like, anxious or stressed or like, whatever, and be like, okay, but like, I’m fine” (P13, Group 1). Designers should consider this difference amongst users and consider implementing a way to customize the granularity per each user. For example, maybe each user can set their own options and associated icons to choose from.
6. Limitations and Future Work

Over the course of this thesis, we have discussed the effects of the socialization between strangers and friends on mood tracking. However, our research would be amiss without discussing the limitations of our study and what could be done next based on our results.

One of the most notable limitations in this study is the timespan that we had to run it. Our experiment ran for exactly 3 weeks (or 21 days). Over these 3 weeks, we saw variations in engagements over time. Namely, user engagement tended to decrease after the first week. This could be due to a variety of factors, such as the garden reset timeline or simply because the app lost its novelty to users. Behavior change and habit formation, however, can take months or longer to fully form, which is much longer than the course of our study [9]. In order to get a better picture of how app usage and interaction might change over time, we should consider running this study, or one similar to it in nature, again over the course of several months. We should especially do this to look more at how the app influences habit forming and long-term behavior change.

Another factor that warrants more investigation is the level of anonymity assigned to each user. Each in the stranger group gave themselves a garden name (a name for their garden that had no identifying information in it) to ensure that they didn’t know who each other were. While this ensured that our experimental condition held, some users commented that they would have preferred to have a name associated with the others in their community to humanize them more. Due to the small size of Dartmouth, it would not have been possible to ensure our experimental condition would hold while having first names associated with users (even within our study it turned out that some users in the stranger’s group knew each other in real life). On the converse, users in the friend group said that they would be interested in trying the study again while being anonymous within their group of friends. Thus, the concept of being anonymous or known within a group of friends or strangers warrants more investigation.

*Sprout V2* is the *Sprout* project’s first attempt at developing informatics in the mental health sphere. For future work, we want to refine the scope of the project to be more towards tracking serious mental illnesses or chronic illnesses. Hannah Doris, a member of our lab, is currently working on extending our findings from *Sprout V2* to design a future iteration of *Sprout* for patients and caregivers of Parkinson’s disease. As a part of this project, students in the Empower Lab are working on turning *Sprout* into a full stack web application to make it more accessible, as well as allow for other features, such as ambient displays.
7. Conclusion

In this thesis, we introduced Sprout V2, a social mood tracking app that uses a garden motif to motivate users to be more mindful of their mood and other’s mood. Through Sprout V2, we aimed to investigate the dilemma of disclosure: the tension between gaining benefits from social support and disclosure of condition. Specifically, we aimed to see if our intervention could make people feel more comfortable in disclosing data related to mental health. We also gained valuable design criteria that will inform future work done in our lab (and hopefully beyond).

First, we found that the group that tracked with friends misrepresented their mood more, but gained more benefits. From this, we learn that we should allow users the option for more privacy. One way to do this would be to augment the mood tracking experience by allowing for more options, such as keeping a tracked mood private/hidden, letting users specify if they want to be reached out to, and so on. Furthermore, as discussed in Section 6, we could implement the group of friends such that, while users know which friends are in their group, users don’t know who each garden belongs to. Also, adding in features to encourage users to be more honest with one another could prove to be advantageous. Through the addition of these design criteria we could potentially gain more honesty in groups with social features while also harnessing the benefits that come with socialization.

Second, we found that there should be levels of social inclusion. Users had differing opinions on who they would want to track with. For example, some users said they would never use the app honestly if they tracked with family members, while others said that would be something they’d love to do to keep in contact with their family. Users in the individual group (group 0), for the most part, said that they would feel uncomfortable with others seeing their mood, although this might be due to them being accustomed to tracking individually after the study. Letting users self-select into groups that they make would allow all users to decide for themselves who they want to track with and to what extent they know these people. Furthermore, we also found that social pressure strongly encouraged users to track, even with anonymous strangers. Designers in the future should consider the positive potential of harnessing social pressure, even from anonymous strangers.

Third, we found that users wanted increased customizability and data analysis. This finding feels universal in most design insights, but still warrants mentioning. Especially when users are tracking personal data, they want to see themselves represented in their tracking. From our experiment, we found that users should be able to continuously add to their experience and that designers should take caution when having progress cleared or removed (such as a garden reset) even if it is just temporary. Furthermore, especially for tracking apps, users want to be motivated to achieve a goal. Users felt that if they had better visualizations of their data, such as a graph, and insights into their behavior they
would have a goal to work for within the app. Tracking for the sake of tracking was not in and of itself interesting for users.

We hope that our findings can inform future design work done in creating applications for mental health tracking and improvement.
Four years ago, I wrote my Dartmouth admissions essay in response to the following quote. Today, I write my thesis in response to it.

*We do know that no one gets wise enough to really understand the heart of another, though it is the task of our life to try.*

— Louise Erdrich, *The Bingo Palace* [41]
Bibliography


A. Code

A.1. Main Codebase

Our codebase was developed in GitHub. The code for Sprout V2 can be found at

https://github.com/empower-lab-dartmouth/sprout-v2

The code for Sprout V2’s cloud functions can be found at

https://github.com/empower-lab-dartmouth/sprout-v2-functions

To request GitHub permissions please email daniel.e.westphal.23@dartmouth.edu.

A.2. Python Script

We used a Python script to update the dates on the documents in the gardenItems Firestore collection. We downloaded the day before’s data from Firefoo as a JSON file, ran it through the script, and then uploaded the new data via Firefoo. Below is the Python script we ran.

```python
import uuid
import json

def replace(yesterday, today):
    f = open('gardenItems_old.json')
    data = json.load(f)
    f.close()
    data = data['data']
    new_data = {}
    for key in data.keys():
        new = str(uuid.uuid4())
        item = data[key]
        if item['date'] == yesterday:
            item['documentName'] = new
```
item['date'] = today
new_data[new] = item

print(new_data)

json_object = json.dumps(new_data, indent=4)

with open("./gardenItems_new.json", "w") as outfile:
    outfile.write(json_object)

replace("04-26-2023", "04-27-2023")

A.3. Analysis

The Jupyter notebooks used for data analysis can be found at

https://github.com/empower-lab-dartmouth/sproutv2-analysis

See Section A.1 for how to gain access.
B. Recruiting

B.1. Flyer

Below is the flyer that we used for promoting and advertising the experiment.
The Empower Lab is running a 3-week study on wellness self-tracking technology. We have developed an app that lets you track your mood and visualize it with trees and flowers. If you are interested in tracking data and use an iPhone, please keep reading!

**Participation**
- Install and use the application on your iPhone at least once a day (more if you'd like!) for 3 weeks
- Visit our lab at the start and end of the study and complete 2 surveys

**Eligibility**
- You must have an iPhone
- You must be interested in tracking wellness data

**Compensation**
- $100 gift card of your choice (upon completion)

Questions? Contact us: daniel.e.westphal.23@dartmouth.edu

https://tinyurl.com/sproutv2
B.2. Screening Survey

Below is the screening survey that the flyer qr code linked to.
Sprout V2 Study Screening

The empower lab at the Dartmouth School of Engineering is seeking volunteers to take part in a **three week research study** that aims to create alternative visualizations for self-tracking tools. Please respond to the following questions. We will review your information and get back to you about participation. All participants will be given a **$100 gift card** if they are selected for and complete the study.

* Indicates required question

1. How old are you? *

2. What are your name and pronouns? *

3. What is your race? *

* Check all that apply.

- [ ] African/Black
- [ ] Asian
- [ ] Caucasian/White
- [ ] Hispanic/Latinx
- [ ] Native American
- [ ] Native Hawaiian or Pacific Islander
- [ ] Prefer not to say
- [ ] Other: ____________________________
4. What class year are you? *

*Mark only one oval.*

- '20
- '21
- '22
- '23
- '24
- '25
- '26
- Grad
- Faculty/Staff
- Other

5. Have you ever tracked different aspects of your health (e.g. steps, sleep, mood, etc)? *

*Check all that apply.*

- Yes, using a mobile application
- Yes, using a smartwatch (Apple Watch, Fitbit, etc)
- Yes, using paper (e.g. journal, diary, year-in-pixels)
- Yes, other (please enter in ‘Other’ field below)
- No, I have never tracked personal data.

- Other: _____________________________
6. Are you interested in tracking wellness data (e.g. your mood) using a smartphone application?

Mark only one oval.

Not interested at all

1

2

3

4

5

Extremely interested
7. How interested would you be in social features that allow you to interact with other app users that are strangers?

* Mark only one oval. 

Not interested at all

1

2

3

4

5

Extremely interested
8. How interested would you be in social features that allow you to interact with other app users that you are friends with?  

Mark only one oval.

Not interested at all

1

2

3

4

5

Extremely interested

9. If you are interested in social features allowing you to interact with people you are friends with please list the friends' names below (and ensure they fill out the form)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
10. Did you participate in the study using the Sprout App in Fall of last year? *

*Mark only one oval.*

☐ Yes
☐ No
☐ Unsure

11. Any questions or comments for us?

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Google Forms
B.3. Confirmation Survey

Below is the confirmation form participants were asked to fill out after being selected for the experiment.
Sprout Confirmation Survey

Please confirm your participation in our study. If you have any issues, questions, or concerns, please reach out daniel.e.westphal.23@dartmouth.edu

* Indicates required question

1. Email *

2. Name (first and last) *

3. Please confirm you still wish to participate in this study (if you do not please do not fill out this form and email daniel.e.westphal.23@dartmouth.edu)

   Mark only one oval.
   ○ Yes, I wish to participate

4. Please confirm that you have an IPhone *

   Mark only one oval.
   ○ Yes, I have an IPhone

5. What model iPhone and what iOS version is it running? *

https://docs.google.com/forms/d/1IFrUBHO9ZxzTG01CuB2nVhZL7Uiwrv3tGNwM_vnczfw/edit
6. I understand that as part of the study I am expected to the following:
   - onboarding (complete a survey, brief interview, and download an app at the lab)
   - during the three week study (use the app at least twice a day (can be for as little as a minute) and take one screenshot a day of your individual view, keep notifications on during the day, turn off do not disturb during the day)
   - offboarding (complete a survey and brief interview at the lab)

   Mark only one oval.
   
   [ ] Yes, I understand

7. Comments, questions, or concerns?

   Remember
   Participation in this study is voluntary and you can stop at any time. After offboarding you will receive a $100 gift card of your choice as compensation for your time and a thank you.

   The research team will protect the information you provide which will be anonymized and not associated with your identity.

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C. Onboarding

C.1. Survey

Below is the onboarding survey.
Onboarding Survey
Welcome! Thank you for your interest in our research study.

This survey will take you approximately 10-15 minutes. Your feedback will help us better understand and improve technology to support health management. There are no right or wrong answers to these questions; we are interested in knowing what you really think.

The research team will protect the information you provide, which will be anonymized and not associated with your identity.

Note that for this survey, health refers to both physical and mental health.

* Indicates required question

1. Email *

General Health Self-Assessment

2. In general, would you say your health is

Mark only one oval.

☐ Excellent
☐ Very good
☐ Good
☐ Fair
☐ Poor
3. How **important** is health to you personally

   *Mark only one oval.*

   - [ ] Extremely important
   - [ ] Very important
   - [ ] Moderately important
   - [ ] Slightly important
   - [ ] Not very important

   **Satisfaction**

4. How satisfied are you with your current **physical health**

   *Mark only one oval.*

   - [ ] Very satisfied
   - [ ] Moderately satisfied
   - [ ] Slightly satisfied
   - [ ] Neither satisfied nor unsatisfied
   - [ ] Slightly unsatisfied
   - [ ] Moderately unsatisfied
   - [ ] Very unsatisfied
5. How satisfied are you with your current **mental health**

   *Mark only one oval.*

   - [ ] Very satisfied
   - [ ] Moderately satisfied
   - [ ] Slightly satisfied
   - [ ] Neither satisfied nor unsatisfied
   - [ ] Slightly unsatisfied
   - [ ] Moderately unsatisfied
   - [ ] Very unsatisfied

6. How satisfied are you with your current **life situation in general**

   *Mark only one oval.*

   - [ ] Very satisfied
   - [ ] Moderately satisfied
   - [ ] Slightly satisfied
   - [ ] Neither satisfied nor unsatisfied
   - [ ] Slightly unsatisfied
   - [ ] Moderately unsatisfied
   - [ ] Very unsatisfied

**Motivation and Hopefulness**
7. How motivated are you to adopt a **healthier lifestyle**?

   *Mark only one oval.*

   - [ ] Extremely
   - [ ] Very much
   - [ ] Moderately
   - [ ] Slightly
   - [ ] Not at all

8. Overall how hopeful are you **feeling today** about your health?

   *Mark only one oval.*

   - [ ] Very hopeful
   - [ ] Moderately hopeful
   - [ ] Neither hopeless nor hopeful
   - [ ] Moderately unhopeful
   - [ ] Very unhopeful

**Process Mindset - General**

Now think about the **process** of what it is like to **get healthy** or **stay healthy**.

9. The process of becoming healthy and/or maintaining good health is

   *Mark only one oval.*

   - [ ] Very easy
   - [ ] Somewhat easy
   - [ ] Somewhat difficult
   - [ ] Very difficult
10. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very pleasant
- [ ] Somewhat pleasant
- [ ] Somewhat unpleasant
- [ ] Very unpleasant

11. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very relaxing
- [ ] Somewhat relaxing
- [ ] Somewhat stressful
- [ ] Very stressful

12. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very convenient
- [ ] Somewhat convenient
- [ ] Somewhat inconvenient
- [ ] Very inconvenient
13. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very fun
- [ ] Somewhat fun
- [ ] Somewhat boring
- [ ] Very boring

14. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very social
- [ ] Somewhat social
- [ ] Somewhat lonely
- [ ] Very lonely

15. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very indulgent
- [ ] Somewhat indulgent
- [ ] Somewhat depriving
- [ ] Very depriving

PROMIS–29 Profile v2.0 -- Anxiety, Depression
16. The next question asks you about your mental health. Please rate how frequently you experienced each of the situations in the past 7 days

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt hopeful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt depressed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt worthy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt capable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt anxious</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Demographics

17. First and Last Name *

18. Gender Identity *

19. Age *

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C.2. User Guides

Below are the user guides for each group.

C.2.1. Group 0
User Guide

App Overview

Our research is designed to motivate your tracking behavior. Specifically, the app supports you in tracking your mood over time. To incentivize tracking, you earn droplets 💧 and seeds 🌱 that you can use to grow your tree 🌳 and create flowers 🌸 in your garden. Moreover, you will be presented with a historical view, allowing you to visualize your progress over time. At the end of each week, your garden is reset; your tree becomes small, and your flowers are removed.

Growing Your Personal Garden

You can only grow the tree up to a maximum height. You can still earn droplets after, but you will not be able to use them. On the other hand, you can grow an unlimited number of flowers in your garden. You gain one droplet and one seed every time you track your mood within an hour.
### Interacting With the App

<table>
<thead>
<tr>
<th>Garden 1</th>
<th>Interaction</th>
</tr>
</thead>
</table>
| ![Garden 1 Image](image1.png) | 1. Click this to toggle between moving/planting mode. *Locked* (moving mode) means you can move tree by tapping and holding screen on specific location on ground  
2. Your personal tree  
3. Click here to log your mood. |

<table>
<thead>
<tr>
<th>Garden 2</th>
<th>Interaction</th>
</tr>
</thead>
</table>
| ![Garden 2 Image](image2.png) | 1. Click this to toggle between moving/planting mode. *Unlocked* (planting mode) means you can to use droplets or seeds  
2. Click to select seeds  
3. Click on ground to grow flower  
4. Click to select droplets  
5. Click anywhere to drop droplet, making sure it is above the tree otherwise you lose the droplet 😔 |
<table>
<thead>
<tr>
<th>Personal History</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Personal History" /></td>
<td>1. An item in the list representing when a mood was tracked and what that mood was</td>
</tr>
</tbody>
</table>

**Troubleshooting & Contact**
- If something is not appearing or things are not updating, just close the app and open it again
- Try not logout too much as it might cause some issues

If you encounter any problem while using the app or if you have any feedback about the project, feel free to contact us at: daniel.e.westphal.23@dartmouth.edu or +1 (203) 803 8023

**Thank you for your participation!**
C.2.2. Group 1
App Overview

Our research is designed to motivate your tracking behavior. Specifically, the app supports you in tracking your mood over time. To incentivize tracking, you earn droplets💧 and seeds высоко that you can use to grow your tree.green and create flowers.🌸 in your garden. Moreover, you will be presented with a historical view, allowing you to visualize your progress over time. At the end of each week, your garden is reset; your tree becomes small, and your flowers are removed.

Growing Your Personal Garden

You can only grow the tree up to a maximum height. You can still earn droplets after, but you will not be able to use them. On the other hand, you can grow an unlimited number of flowers in your garden. You gain one droplet and one seed every time you track your mood within an hour.

Social Features

You get to share a community garden with a group of anonymous users. The community garden view changes based on how others are doing.

Community Garden

This view shows the parcel of each group member along with their respective tree. The flowers you plant in your personal garden also appear in the community garden. However, the flowers 🌸 are distributed equally among group members. Other features include the ability to send custom messages📨 (anonymous or non-anonymous) to individual members or the community as a whole.
### Interacting With the App

#### Garden 1

<table>
<thead>
<tr>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Click</strong> this to toggle between moving/planting mode. <strong>Locked</strong> <em>(moving mode)</em> means you can move tree by tapping and holding screen on specific location on ground</td>
</tr>
<tr>
<td>2. Your personal tree</td>
</tr>
<tr>
<td>3. <strong>Click</strong> here to log your mood.</td>
</tr>
</tbody>
</table>

#### Garden 2

<table>
<thead>
<tr>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Click</strong> this to toggle between moving/planting mode. <strong>Unlocked</strong> <em>(planting mode)</em> means you can to use droplets or seeds</td>
</tr>
<tr>
<td>2. <strong>Click</strong> to select seeds</td>
</tr>
<tr>
<td>3. <strong>Click</strong> on ground to grow flower</td>
</tr>
<tr>
<td>4. <strong>Click</strong> to select droplets</td>
</tr>
<tr>
<td>5. <strong>Click</strong> anywhere to drop droplet, making sure it is above the tree otherwise you lose the droplet 😔</td>
</tr>
</tbody>
</table>
1. Your plot in the community garden. Flowers are shared by all community members to promote cooperation
2. 🗣️ to view messages (received & sent)
3. 📩 to send a messenger to community member
4. The most recently tracked mood of that respective garden
1. Click to refresh message
2. Click to close messages screen
3. Click to toggle between received and sent messages
4. Message received from an anonymous community member

Send Messages

1. Click to send message
2. Click to select recipient of message
3. Preview of message
4. Click to toggle between anonymous and non anonymous message. By default, this is always toggled, meaning messages are anonymous.

Personal & Community History
1. Click to toggle between personal history and community history
2. An item in the list representing when a mood was tracked and what that mood was
3. An item in the community list showing who tracked this mood and when

Troubleshooting & Contact

- If something is not appearing or things are not updating, just close the app and open it again
- Try not logout too much as it might cause some issues

If you encounter any problem while using the app or if you have any feedback about the project, feel free to contact us at: daniel.e.westphal.23@dartmouth.edu or +1 (203) 803 8023

Thank you for your participation!
C.2.3. Group 2
User Guide

App Overview
Our research is designed to motivate your tracking behavior. Specifically, the app supports you in tracking your mood over time. To incentivize tracking, you earn droplets 🌧️ and seeds 🌱 that you can use to grow your tree 🌳 and create flowers 🌸 in your garden. Moreover, you will be presented with a historical view, allowing you to visualize your progress over time. At the end of each week, your garden is reset; your tree becomes small, and your flowers are removed.

Growing Your Personal Garden
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You get to share a community garden with a group of your friends (other users). The community garden view changes based on how others are doing.

Community Garden
This view shows the parcel of each group member along with their respective tree. The flowers you plant in your personal garden also appear in the community garden. However, the flowers 🌸 are distributed equally among group members. Other features include the ability to send custom messages 💌 (anonymous or non-anonymous) to individual members or the community as a whole.
### Interacting With the App

#### Garden 1

<table>
<thead>
<tr>
<th>Interaction 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Click</strong> this to toggle between moving/planting mode. <strong>Locked</strong> (moving mode) means you can move tree by tapping and holding screen on specific location on ground.</td>
</tr>
<tr>
<td><strong>2. Your personal tree</strong></td>
</tr>
<tr>
<td><strong>3. Click</strong> here to log your mood.</td>
</tr>
</tbody>
</table>

#### Garden 2

<table>
<thead>
<tr>
<th>Interaction 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Click</strong> this to toggle between moving/planting mode. <strong>Unlocked</strong> (planting mode) means you can to use droplets or seeds.</td>
</tr>
<tr>
<td><strong>2. Click</strong> to select seeds</td>
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<tr>
<td><strong>5. Click</strong> anywhere to drop droplet, making sure it is above the tree otherwise you lose the droplet 😔</td>
</tr>
<tr>
<td>Community Garden</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>1. Your plot in the community garden. Flowers are shared by all community members to promote cooperation</td>
</tr>
<tr>
<td>2. 💌 to view messages (received &amp; sent)</td>
</tr>
<tr>
<td>3. 📩 to send a messenger to community member</td>
</tr>
<tr>
<td>4. The most recently tracked mood of that respective garden</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Messages (Inbox)</th>
<th>Interaction</th>
</tr>
</thead>
</table>
1. Click to refresh message
2. Click to close messages screen
3. Click to toggle between received and sent messages
4. Message received from an anonymous community member

Send Messages

1. Click to send message
2. Click to select recipient of message
3. Preview of message
4. Click to toggle between anonymous and non anonymous message. By default, this is always toggled, meaning messages are anonymous.
1. Click to toggle between personal history and community history
2. An item in the list representing when a mood was tracked and what that mood was
3. An item in the community list showing who tracked this mood and when

Troubleshooting & Contact
- If something is not appearing or things are not updating, just close the app and open it again
- Try not logout too much as it might cause some issues

If you encounter any problem while using the app or if you have any feedback about the project, feel free to contact us at: daniel.e.westphal.23@dartmouth.edu or +1 (203) 803 8023

Thank you for your participation!
C.3. Self-Interview

Below are the self interview questions and instructions for each group.

C.3.1. Group 0
Instructions: Take approximately five to ten minutes (total) to voice record yourself responding to the following prompts. You can use the voice memos app to record your responses. Make sure that you are in a relatively quiet place and that you speak clearly. Once you are finished, send your voice recording to daniel.e.westphal.23@dartmouth.edu. Please name your voice recording “[LastnameFirstname]” if possible.

Pre
1. If you previously took part in a related study on fitness tracking (run by Pape Sow Traore) please briefly speak about your experience and what motivated you to sign up for this study.

Goals & Motivations
1. Why do you track or want to track health? What drew you to this study?
2. Is there anything you have been tracking? What tools have you used (could be digital tools like a smartphone app or physical tools like a diary)?
3. Is there anything that could motivate you to track your health more?
4. What do you dislike about tracking / What would make tracking less boring or more fun?

Social
1. Have you ever tracked data with anyone else before (e.g. through an app like Strava)?
2. Have you consulted with anyone or any resource about your health tracking? (e.g. family, friends, medical professionals, etc.)
   a. What types of help were you looking for? Did you find it?
C.3.2. Groups 1 & 2
Instructions: Take approximately five to ten minutes (total) to voice record yourself responding to the following prompts. You can use the voice memos app to record your responses. Make sure that you are in a relatively quiet place and that you speak clearly. Once you are finished, send your voice recording to daniel.e.westphal.23@dartmouth.edu. Please name your voice recording “[LastnameFirstname]” if possible.

Pre
1. If you previously took part in a related study on fitness tracking (run by Pape Sow Traore) please briefly speak about your experience and what motivated you to sign up for this study.

Goals & Motivations
1. Why do you track or want to track health? What drew you to this study?
2. Is there anything you have been tracking? What tools have you used (could be digital tools like a smartphone app or physical tools like a diary)?
3. Is there anything that could motivate you to track your health more?
4. What do you dislike about tracking / What would make tracking less boring or more fun?

Social
1. Have you ever tracked data with anyone else before (e.g. through an app like Strava)?
2. Have you consulted with anyone or any resource about your health tracking? (e.g. family, friends, medical professionals, etc.)
   a. What types of help were you looking for? Did you find it?
3. What do you think about the community aspect of our idea?
D. Offboarding

D.1. Survey

Below is the offboarding survey.
Offboarding Survey
Welcome! Thank you for participating in our research study.

This survey will take you approximately 10-15 minutes. Your feedback will help us better understand and improve technology to support health management. There are no right or wrong answers to these questions; we are interested in knowing what you really think.

The research team will protect the information you provide, which will be anonymized and not associated with your identity.

Note that for this survey, health refers to both physical and mental health.

* Indicates required question

1. Email *

General Health Self-Assessment

2. In general, would you say your health is

Mark only one oval.

☐ Excellent
☐ Very good
☐ Good
☐ Fair
☐ Poor
3. How **important** is health to you personally

*Mark only one oval.*

- [ ] Extremely important
- [ ] Very important
- [ ] Moderately important
- [ ] Slightly important
- [ ] Not very important

**Satisfaction**

4. How satisfied are you with your current **physical health**

*Mark only one oval.*

- [ ] Very satisfied
- [ ] Moderately satisfied
- [ ] Slightly satisfied
- [ ] Neither satisfied nor unsatisfied
- [ ] Slightly unsatisfied
- [ ] Moderately unsatisfied
- [ ] Very unsatisfied
5. How satisfied are you with your current **mental health**

*Mark only one oval.*

- [ ] Very satisfied
- [ ] Moderately satisfied
- [ ] Slightly satisfied
- [ ] Neither satisfied nor unsatisfied
- [ ] Slightly unsatisfied
- [ ] Moderately unsatisfied
- [ ] Very unsatisfied

6. How satisfied are you with your current **life situation in general**

*Mark only one oval.*

- [ ] Very satisfied
- [ ] Moderately satisfied
- [ ] Slightly satisfied
- [ ] Neither satisfied nor unsatisfied
- [ ] Slightly unsatisfied
- [ ] Moderately unsatisfied
- [ ] Very unsatisfied

**Motivation and Hopefulness**
7. How motivated are you to adopt a **healthier lifestyle**?

   *Mark only one oval.*

   - Extremely
   - Very much
   - Moderately
   - Slightly
   - Not at all

8. Overall how hopeful are you **feeling today** about your health?

   *Mark only one oval.*

   - Very hopeful
   - Moderately hopeful
   - Neither hopeless nor hopeful
   - Moderately unhopeful
   - Very unhopeful

   **Process Mindset - General**

   Now think about the **process** of what it is like to **get healthy** or **stay healthy**.

9. The process of becoming healthy and/or maintaining good health is

   *Mark only one oval.*

   - Very easy
   - Somewhat easy
   - Somewhat difficult
   - Very difficult
10. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very pleasant
- [ ] Somewhat pleasant
- [ ] Somewhat unpleasant
- [ ] Very unpleasant

11. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very relaxing
- [ ] Somewhat relaxing
- [ ] Somewhat stressful
- [ ] Very stressful

12. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very convenient
- [ ] Somewhat convenient
- [ ] Somewhat inconvenient
- [ ] Very inconvenient
13. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very fun
- [ ] Somewhat fun
- [ ] Somewhat boring
- [ ] Very boring

14. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very social
- [ ] Somewhat social
- [ ] Somewhat lonely
- [ ] Very lonely

15. The process of becoming healthy and/or maintaining good health is

*Mark only one oval.*

- [ ] Very indulgent
- [ ] Somewhat indulgent
- [ ] Somewhat depriving
- [ ] Very depriving

PROMIS–29 Profile v2.0 -- Anxiety, Depression
16. The next question asks you about your mental health. Please rate how frequently you experienced each of the situations in the past 7 days.

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt hopeful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt depressed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt worthy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt capable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt anxious</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UES-SF
17. Think about your experience using Sprout V2...

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt absorbed using the app</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time slipped away when I was using the app</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I found the app confusing to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I found the app frustrating to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The app is attractive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The app is aesthetically appealing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The app appeals to my senses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My experience with the app was rewarding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the app was worthwhile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UTAUT
18. Think about your experience using Sprout V2...

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found the app useful in my daily life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The app helped me pursue my health goals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning how to use the app was easy for me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interacting with the app was clear and understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the app was fun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the app was enjoyable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the app was entertaining</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using the app has become a habit for me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I intend to continue using the app in the future</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>People who are important to me would want to use the app with me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Social Connectedness
19. After using Sprout V2 rate how much more or less you agree with the following statements

*Mark only one oval per row.*

<table>
<thead>
<tr>
<th></th>
<th>Agree much more</th>
<th>Agree somewhat more</th>
<th>Stayed the same</th>
<th>Agree somewhat less</th>
<th>Agree much less</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel disconnected from the world around me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Even around people I know, I don't feel that I really belong</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel so distant from people</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have no sense of togetherness with my peers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I don't feel related to anyone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I catch myself losing all sense of connectedness with society</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Even among my friends, there is no sense of siblinghood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I don't feel that I participate with anyone or any group.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
General App Reactions

20. How useful was the app in motivating you to track your mood?

*Mark only one oval.*

- [ ] Very useful
- [ ] Quite useful
- [ ] Moderately useful
- [ ] Slightly useful
- [ ] Not at all useful

21. It is possible that users sometimes tracked a mood that did not accurately reflect their true mood at that moment (e.g. due to peer pressure, data privacy concerns, perception, etc.). How often did you track a mood other than the true mood you were experiencing?

*Mark only one oval.*

- [ ] Always (I never accurately tracked what I was feeling)
- [ ] Very Often
- [ ] Sometimes
- [ ] Rarely
- [ ] Never (I always accurately tracked how I was feeling)

22. Please provide some context on why you did/did not accurately track your true mood?
23. Did you encounter any problems while using the app, or was there anything you found confusing or annoying about the app? Please explain.

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

24. Has there been anything delightful or pleasantly surprising while using the app? Please explain.

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

25. What were your favorite aspects of the app?

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________
26. How likely would you be to continue using our app?

*Mark only one oval.*

- [ ] Very Likely
- [ ] Moderately Likely
- [ ] Neither Likely nor Unlikely
- [ ] Moderately Unlikely
- [ ] Very Unlikely

27. Please elaborate on your answer from above

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

28. I felt more connected to my mood and emotions due to using this app

*Mark only one oval.*

- [ ] Strongly Agree
- [ ] Agree
- [ ] Neither Agree nor Disagree
- [ ] Disagree
- [ ] Strongly Disagree
29. If you participated in a previous study using Sprout, discuss any major differences you noticed/felt between your engagement with the app across studies.

Demographics

30. First and Last Name *

31. Gender Identity *

32. Age *

This content is neither created nor endorsed by Google.
D.2. Interview Guide

Below is the offboarding focus group/interview guide.
Instructions: Start by thanking everyone for their participation in the study. Then move on to explain the different groups and what features they had available to them: control, strangers, friends. Afterwards, give a brief overview of the focus group question topics, the timespan, and that it will be recorded. Begin the recording and ask everyone to vocalize their consent to be recorded. Instruct people to still feel free to add on even if they weren’t in the group the question focuses on. Make sure to tell participants to ground their answers in the design of the app.

*Questions highlighted in green are prioritized due to importance*

**General**

1. How typical (normal) have the last 3 weeks of the study period been for you? (compared to if you weren’t using the app?)
2. Has there been anything particularly confusing while using the app? What have you disliked about your experience with the app?
3. Has there been anything you found delightful while using the app? What have you liked about your experience with the app?
4. Did you ever feel pressured to track a better mood than you actually felt (due to pressure of others seeing it)?
5. Do you feel more in touch with your emotions after completing this study? Did you feel more in touch with them during the study?
6. What would you envision for this app in terms of long term use?

**Social**

1. Did you feel a sense of community with the other people who were tracking with you? Did you ever feel angry/annoyed at others within your community?
2. Did you feel like you were competing or collaborating with your group?
3. Would you prefer to do it with friends or people who you do know in real life? Why or why not?
   a. If so, who might you like to track with?
4. Did you have any concerns about privacy when tracking in this sort of social environment?
5. Did you ever find yourself reaching out to others when you saw they tracked a sad or upset mood? Why or why not?
6. Why did you largely choose to send community messages instead of individual messages? Why did you choose to send mostly anonymous messages instead of attaching your identity to it?
7. Say you were tracking more sensitive mental health data, such as how often you take medication, manic/depressive episodes, therapy appointment adherence, etc. would you feel comfortable with those data being displayed in the garden, knowing the actual underlying information was abstracted into a flower/tree/etc.?”

**In-app usage**

1. How did you feel about using the app to track your mood?
2. Now I’d like to ask about how you tended to use the app:
a. When did you use the app? Did you start to build a routine around using the app (e.g., checking before bed?)

b. How did you feel when you used the app?

3. How could the app have been better for you?
   a. Potential prompts: features, functions, services you wish the app to have.
   b. Did you enjoy the garden resetting? How else would you have structured this feature?

   Would you rather it reset more or less?

4. What other features do you wish the app would have that would motivate your health behavior?

5. Has there been anything about using the app that you found particularly motivating?

6. What do you feel about the notifications from the app?
   a. Daily reminder to check app
   b. Mood updates

Ended

1. Did a friend, family member, coworker, stranger, or anyone else ever notice you using the app or ask you about the Sprout garden?
   a. If yes: how did you feel about talking about the app/garden with them?

2. Any other noteworthy interpersonal experiences you had related to the app?

3. Would you continue to use this app if given the opportunity?

4. Those are all the questions I have for you. Is there anything about healthy behavior that you would like to mention that we haven’t not covered so far but you’d like to tell us?

5. Anything else about your experience with the app you’d like to tell us?

6. Anything else you would like to share with me?
E. Supplementary Data

E.1. Panels

We asked one user in each group to send us a screenshot of their garden and their community’s garden (if applicable) for one week. Note that we do not include a panel for group 2’s community page since it contained names of users in it.
Figure E.1: A week long view of a user’s garden. The user was in group 0.
Figure E.2.: A week long view of a user’s garden. The user was in group 1.
Figure E.3.: A week long view of a user’s community garden. The user was in group 1.
Figure E.4.: A week long view of a user’s garden. The user was in group 2.
E.2. Figures

Figure E.5.: Moods tracked by each group per day.

Figure E.6.: Average response from users regarding whether the app helped them to pursue their health goals. Data gathered from the offboarding survey.
Figure E.7.: Average response from users regarding whether they would continue using the app in the future. Data gathered from the offboarding survey.

Figure E.8.: Average response from users regarding how absorbed they felt in the app during use by group. Data gathered from the offboarding survey.
Figure E.9.: Average response from users regarding how time slipped away while using the app by group. Data gathered from the offboarding survey.

Figure E.10.: Average response from users regarding how fun the app was by group. Data gathered from the offboarding survey.
Figure E.11.: Average response from users regarding how entertaining the app was by group. Data gathered from the offboarding survey.

Figure E.12.: Average response from users regarding how useful the app was in motivating them to track their mood. Data gathered from the offboarding survey.
E.3. Tables
<table>
<thead>
<tr>
<th></th>
<th>Group 0</th>
<th>Group 1</th>
<th>Group 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 1</td>
<td>Week 2</td>
<td>Week 3</td>
<td>Week 1</td>
<td>Week 2</td>
<td>Week 3</td>
<td>Week 1</td>
</tr>
<tr>
<td>Average Daily Screen Time (min)</td>
<td>84</td>
<td>104</td>
<td>218</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Individual Messages Sent</td>
<td>0</td>
<td>2</td>
<td>17</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Community Messages Sent</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of Moods Tracked</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Number of Moods Tracked</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Number of Moods Tracked</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number of Moods Tracked</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
| Table E.1: Statistics regarding user engagement for each group and how they changed over the course of each week of the study.