

Alli: A Mobile Application for Substance Misuse

Srikanth Rao Parcha
CIS6930

Gainesville, FL, USA
parcha.srikanthr@ufl.edu

Ravi Teja Lanka
CIS6930

Gainesville, FL, USA
raviteja.lanka@ufl.edu

Rishabh Tatiraju
CIS6930

Gainesville, FL, USA
rtatiraju@ufl.edu

Lisa Touchton
CIS6930

Gainesville, FL, USA
lisatouchton@ufl.edu

Abstract—Substance misuse is a critical healthcare challenge today which includes the usage of legal and illegal substances inappropriately. A major problem in tackling substance misuse is the adherence to the rehabilitation process and preventing a relapse since evidence suggests people think of the short-term when using substances and fail to recognize the future implications of their substance use. Our proposed solution, *Alli* (pronounced *Ally*) is a goal-oriented substance misuse prevention app, which aims to help its users by reminding and motivating them to adhere to their rehabilitation plans. While many apps exist which provide similar solutions, *Alli* incorporates abstinence goals with personal goals and combines multiple features under one roof.

Index Terms—Mobile Health Application, Mobile Health, mHealth, Cybernetics, Persuasive Computing, Addiction, Alcohol, Tobacco, Marijuana

I. INTRODUCTION

A. Contextualization

The problem we are trying to address is substance misuse and adherence to the rehabilitation process, thereby preventing relapse. A major obstacle in successful substance abuse rehabilitation is that people often think about using substances in a short time frame and hence fail to recognize the future implications of their substance use. Another problem is the early drop off from the rehabilitation and abstinence process due to a lack of motivation. We try to address these issues through the means of our proposed solution.

B. Problem

Substance misuse is one of the most critical health challenges the general masses face. Substance misuse includes using legal and illegal substances in inappropriate quantities. Many people are victims of substance misuse, and therefore, most people try rehabilitation. The treatment plan mainly includes a personalized plan that delineates the client's goals and objectives.

As per the approximations by the National Institute on Drug Abuse, substance abuse costs USD 232 billion in health care and USD 740 billion overall in the United States alone [1]. In 2017, more than 21 million people aged 12 or older needed substance abuse treatment. However, only 4 million received any substance use treatment at a facility. Deaths because of misuse of illegal drugs are on the increase. More than 70,000 people died in 2017 due to drug overdose [2]. These and several more morbid facts indicate how severe an issue substance misuse is. *Alli* aims to impact the lives of people who strive to fight their substance addictions.

C. Related work

Quitzilla and *I Am Sober*, and two research projects: *SARA* and *Bridges to Sobriety*. In our discussion we detail popular features and important limitations from these apps that were taken into consideration when developing *Alli*.

D. Proposed solution

Alli: a goal-oriented substance deterrence app, aims to help its users by reminding and motivating them to stick to their plans. Research suggests that having a personal goal attached to their rehabilitation regimen helps to better adhere to it. *Alli* lets its users do so by allowing one or personal goals attached to their abstinence goal. The application also enables users to track their moods on a particular day. Mood tracking helps the user not just to keep a tab on their mental health but also correlate mental health with their abstinence goal to measure progress qualitatively. The application also provides the user with a form of social media. Here, the users can create a new group or join existing ones. These groups aim to act like support groups where users can freely and anonymously communicate with each other. The app explains the importance of associating goals, moods and other features in the app.

E. Benefits

Many of the applications on the Play Store and the App Store, even though they enable users to track their abstinence goals, fail to incorporate personal goals into the application. *Alli*, on the other hand, incorporates abstinence goals with personal goals. Further, along with combining different types of goals, *Alli* also allows users to track their mental health and provides social media/support groups that enable interactions between users with similar abstinence goals. Some applications are available individually to tackle these issues, but none aim to do all of them under the same roof. *Alli* differs in comparison to others in that it combines all the features mentioned above.

II. MOTIVATIONS

One key step that was taken to determine the issues faced by people coping with substance misuse was interviewing Dr Meredith Berry of UF's College of Health and Human Performance. Dr Berry is a specialist in substance abuse, including opioid drugs and nicotine [3]. From that interview and further team brainstorming, we prioritized four key motivations for our app users. The first was ensuring that *Alli* kept track of timed goals, as many who struggle with substance abuse

often think in a short time frame [4]. They fail to understand the future implications of their use and what they strive to become sober for. Another major issue is documenting the unique effects of using multiple substances at once, as well as understanding how mood affects the person's inclination to substance use and vice versa. Having an accurate record of substances taken will help inform doctors on safe treatments to take in the case of an overdose or emergency. It may also help a patient, who is embarrassed to detail their addiction to their doctor, to have a quick and non-invasive way of providing that information. Lastly, Dr Berry emphasized to our team the importance of making people struggling with substance abuse feel less alone in their journey to rehabilitation through a strong support network [4]. In developing Alli, our goal was to create an intuitive interface that fulfils each key motivation.

III. PROPOSED MOBILE APP SOLUTION

A. App Structure

Alli is a mobile application that aims to help people cope with substance abuse. The application has four main functional elements:

1) *Goal-oriented approach*: A goal-oriented approach can be defined as focusing on achieving or reaching a specific task by achieving predetermined milestones. This kind of approach is especially valuable when dealing with substance abuse as it can help the users achieve better adherence. Research suggests that people are more likely to abstain successfully from substances when a personal goal is tied to their coping mechanisms. This is especially true when the personal goal plays a significant role in the person's life, like a sibling's wedding or a convocation. Alli attempts to incorporate such aspects by allowing its users to link an upcoming goal with their rehabilitation journey. These goals will help the user to have a concrete milestone that motivates them to deal with their addiction better.

2) *Abstinence tracking*: The sense of maintaining a streak incentivizes the experience to abstain from indulging in a substance. Alli helps users achieve abstinence adherence by showing their abstinence progress in the form of a timer. This timer shows the time passed since the user's last indulgence with a given substance. This timer can also be reset to zero in case of user non-compliance.

3) *Mood tracking*: Alli also helps its users track how they felt on a particular day, in other words, their mood. Mood tracking helps the user to have an insight into their mental health. In the long term, patterns can be observed, which will allow the user to take necessary precautions or treatments. Mood tracking also helps the user to quantify their addiction progress visually. The user can directly correlate their progress and mental health. Suitable changes can be to their rehab to aid their progress.

4) *Social media (virtual support groups)*: Alli provides its users with a provision to anonymously interact with people coping with similar addictions. A user can create or join virtual support groups. These groups help keep the user motivated

and provide a sense of belonging in an otherwise difficult and lonely journey.

B. App Development

Our app's Frontend and Backend code can be found on GitHub (<https://github.com/DHP2022/dhp2022-app>, <https://github.com/DHP2022/dhp2022-backend>). A video showing our app in action can be found on YouTube (<https://www.youtube.com/watch?v=XSaIQSdRvUs>)

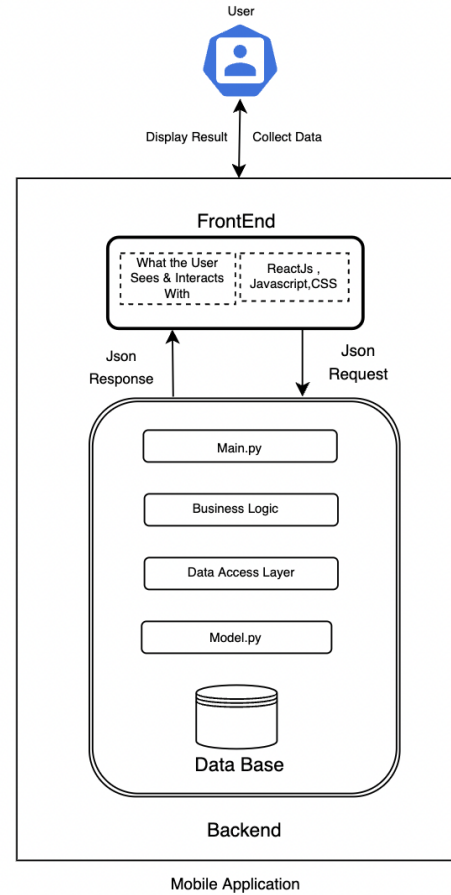


Fig. 1: System Architecture

The app is composed of two parts - the frontend, and the backend. The frontend is built using React Native, a JavaScript-based mobile frontend framework. The backend is implemented using Python, with Flask as the web micro-framework, and SQLite is used as a database.

1) *Frontend*: The frontend is the point of interaction for the user. We have built our frontend with React Native. React Native is an open-source user interface software framework. React Native can be used to develop applications for iOS, Android, Windows, and Web. React Native applications are written JavaScript. Additionally, we have made use of multiple plugins, the most important being *React Native Paper*. Paper provides the developer with a collection of customized and ready-for-production user interface components. The benefits

of using *Paper* building components over from scratch are the ease of use, faster integration and a reliable codebase.

The React Native codebase has significant amount of modularized code abstraction. The codebase is divided into various sections. For user interfaces, components are divided into the type of UI they belong to, like *screens*, *fragments*, *styles*, *themes*, *modals* and standalone *components*. Furthermore, abstraction classes have been created for networking and local data storage.

2) *Backend*: The backend is responsible for storing, organizing and routing the data the user generates from the frontend. It acts as a bridge between the frontend and the database where all the data is stored. Our backend is built using Python. We use HTTP RESTful APIs served using *Flask*, a microframework that acts as an abstraction layer for networking protocols, and thread management. The data is stored in a SQLite database, which is a relational database known for its abstracted usage and low resource footprint.

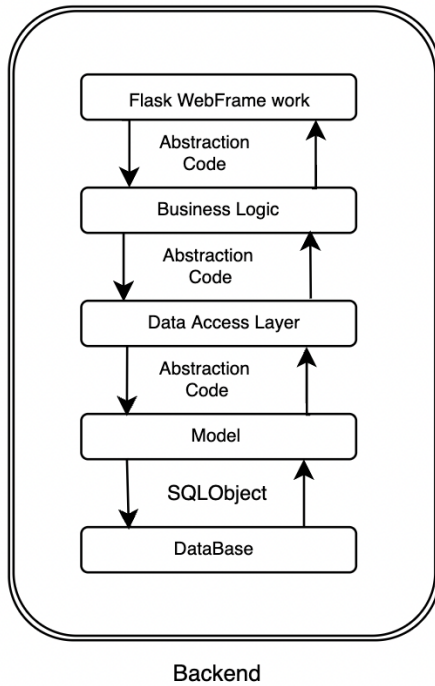


Fig. 2: Backend Architecture

The backend itself is divided into five layers. The topmost layer is the REST API layer built using Flask. This layer is the point of contact to and from the web. The second layer is the business logic layer, which is an abstraction layer holding code to implement critical functionalities. The third layer is the data access layer, which is yet another abstraction layer that is responsible for retrieving and formatting data from the database and providing it for the code written in the business logic layer. The penultimate layer is the models, which hold

class definitions that correspond to the appropriate SQL table structures. Finally, the last layer is the SQLite database itself. Communication between the database and the model layer is performed using *SQLObject*, an ORM plugin written in Python.

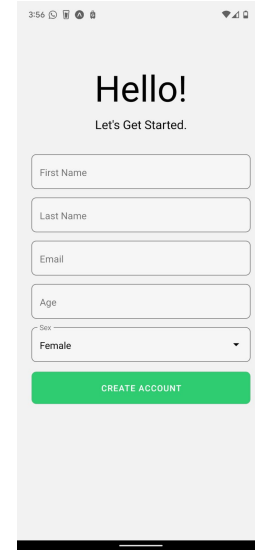


Fig. 3: Sign Up

3) *Sign Up*: To store and retrieve the data, a user must first create their profile. The user has to enter their name, email, age and their gender the first time they use the application. Data in subsequent installs will automatically be retrieved with the given email as the user identifier.

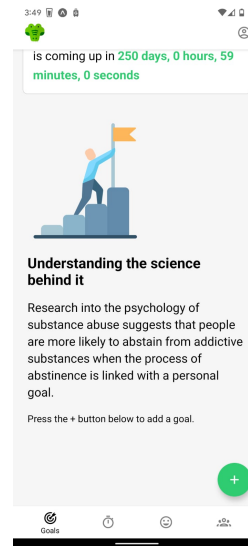


Fig. 4: Goal

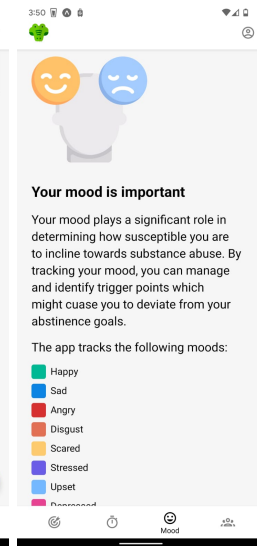


Fig. 5: Mood

4) *Education Screens*: A recurring theme in our app is the education screens for every feature set. Many apps existing in the market today do not explicitly mention why they have built the particular feature. We address that issue by explicitly mentioning to the user how the given feature benefits them.

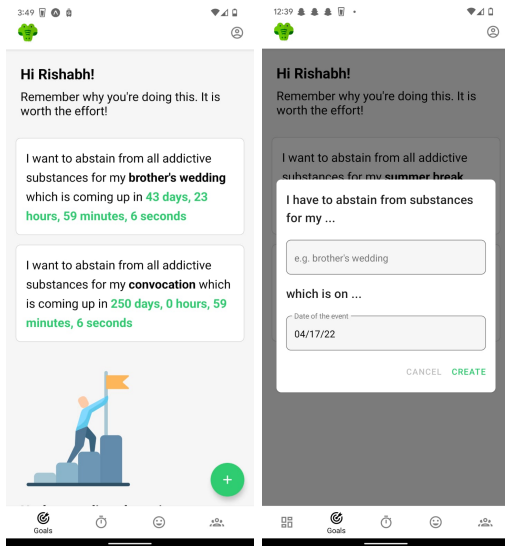


Fig. 6: Goals

Fig. 7: Create Goal

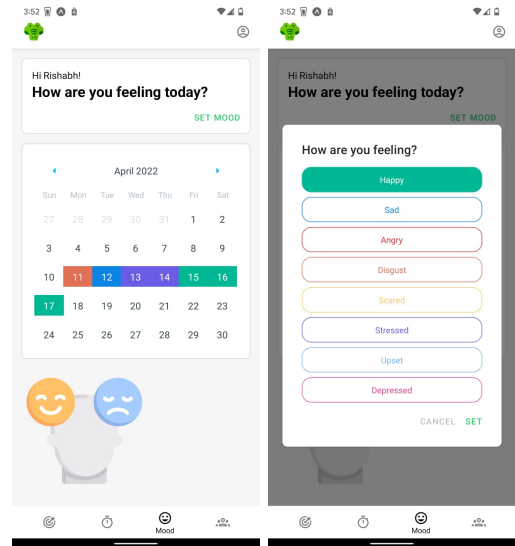


Fig. 9: Mood Tracker

Fig. 10: Set Mood

5) *Goals*: As per the research and observations of Prof. Meredith Berry, a user is more likely to achieve their abstinence goal if they have a personal goal attached to it. The goals feature aims to achieve the same. The goal dashboard screen allows the user to see all their goals in one place. Every goal has a countdown timer, which counts down to the end date of the respective goal. Pressing the + button on the Goals screen opens up a popup that allows users to create a personal goal. Personal goals act as an incentive for people to be more successful in overcoming their addiction. Two inputs are taken to create a goal - (a) the goal name, and (b) the goal date.

7) *Mood*: Our mood greatly determines our susceptibility to indulge in substance abuse. The mood tracker allows a user to set and track their mood daily. The user can change their mood for the day even after already selecting one. The user can only select a mood from the moods available on the screen. Mood Calendar depicts the user's *mood history*. A calendar view of mood history makes it easier to observe any patterns in the user's moods.

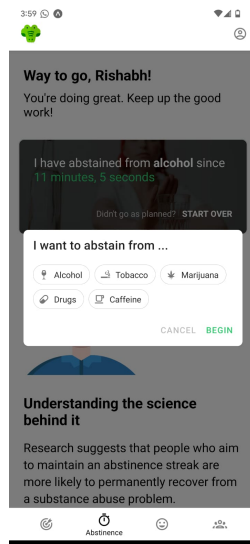


Fig. 8: Create Abstinence

6) *Abstinence*: Abstinence refers to the addiction the user is suffering from. A user can choose to abstain from any of the available substances. The abstinence counter motivates the user to stay away from their abused substance.

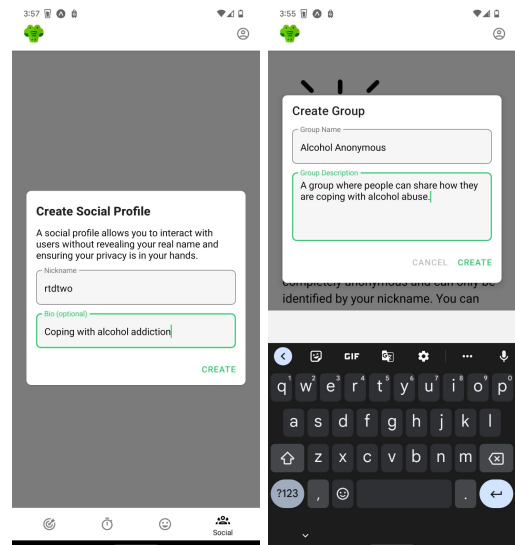


Fig. 11: Create Profile

Fig. 12: Create Group

8) *Social Media (Support Groups)*: Alli also has a social media aspect incorporated into it. When entering the social media section for the first time, a user has to create their social profile. Users can choose to be anonymous by selecting a username that does not give away their identity and can provide a short bio to describe themselves. A user can either join an already existing group or create a new group. To create

a new group, one has to press the menu button at the bottom right, which shows a popup with two text fields. In the first field, the user enters the group's name, and in the latter, the user describes the group's purpose.

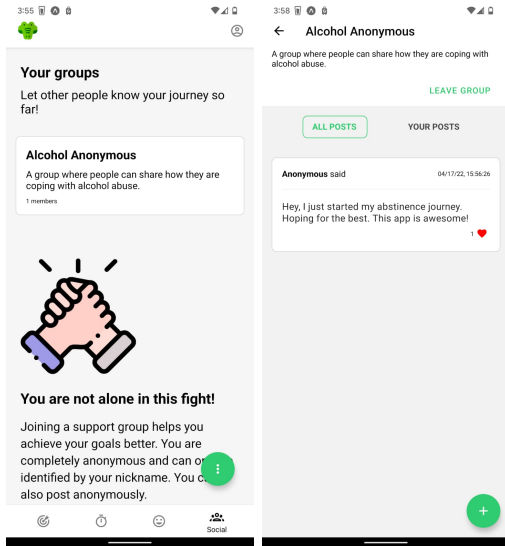


Fig. 13: Your Groups Fig. 14: Group Screen

A group acts as a common ground for users to interact and share their day-to-day experiences. The Groups screen allows the user to see all the groups they are a part of. Upon joining a group, the user can start interacting with others - they can post content, like or unlike posts. The user can also choose to like or later unlike the post/message.

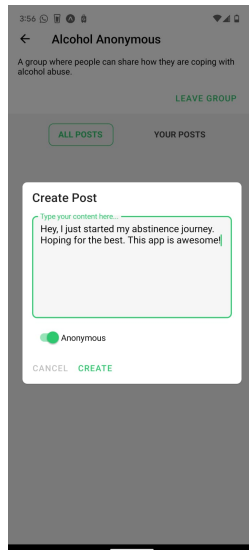


Fig. 15: Create Post

After joining a group, Alli allows a user to communicate with other users in the form of a public message forum. When creating a post, the user can also choose to make their message anonymous using the anonymous toggle button.

IV. DISCUSSION

Alli is a goal-oriented substance deterrence app. The main features of Alli include combining abstinence goals with personal goals. Moreover, Alli also incorporates mood tracking and virtual support groups using social media. Mood tracking helps correlate abstinence tracking with the user's mental state. Over time, various deductions can be made using the patterns observed in the user's mood history. Alli also incorporates social media, which the users can use as support groups. These online support groups are exceptionally viable during the COVID-19 era, where online interactions have been the preferred mode of communication.

While it has multitudes of features to offer, Alli has its shortcomings. Though Alli was well-received during preliminary user testing, we could not perform large-scale user adoption testing. The efficacy of the features can therefore only be clearly defined after robust, large-scale user adoption testing. Furthermore, due to time constraints, we could not implement a feature that periodically notifies the user, i.e. reminders. We believe periodic reminders will help in better user adherence. We were also unable to implement a sophisticated profile creation and authentication protocol. The implemented protocol is sufficient for a proof-of-concept product, however, it falls severely short when it comes to production-level deployment, which will require a more secure authentication protocol. Finally, the data obtained from the mood tracking and abstinence data can be used to find patterns for data analysis. However, to obtain any conclusive inference from this data, a larger user base would be required.

V. RELATED WORK

In our app development journey, we looked at several sobriety trackers. One tracker is *I am Sober*. It is an app available on both Android and iOS which touts a variety of features to conquer addiction. Its main feature is a counter that displays the days, hours, minutes and seconds since the last time a substance was used, as well as keeping track of a user's overall progress and savings [5]. *I Am Sober* also has several different methods of sharing content with other users, including a board where users post why they are pledging to stay sober, filled with family photos and anonymous posts. The app also has more traditional social media posts, and group pledges to take part.

Another app, *Quitzilla* is marketed as a general tracker for both addictions and bad habits [6]. *Quitzilla* uses panels and applets to make a functional and efficient user interface. It shares a few key features with other apps like *I Am Sober*, including setting timers to reach goals, as well as having a calculator to keep track of personal finances and a calendar view of substance use. Where this app differs from *I am Sober* is its rewards system. It has a rewards shop that uses financial information from the app to help the user save up for gifts, such as movie tickets. There are also badges you can earn for reaching longer milestones.

Rabbi et al. [7] created SARA, or the Substance Abuse Research Assistant. It was a mobile app used to collect data

on a group of 14-24-year-olds dealing with binge drinking or marijuana use [7]. They were asked to complete a daily survey as well as tasks to assess reaction time and spatial memory [7]. The group was incentivized by taking care of a virtual aquarium and through cash rewards. The app was effective at keeping participants engaged in submitting data and the researchers plan to add just-in-time interventions to SARA in the future [7].

The app *Bridges to Sobriety* made by Wolf et al. to supplement an Adolescent Substance abuse program [8]. The app was tested on a group of adolescents aged 13-19 from a behavioral health center in Missouri who have substance abuse issues [8]. The app has 2 main features, one being a toolbox with various substance abuse tools and resources, such as hotlines to call, tools to balance the pros and cons of continued substance use, future planning and more [8]. The other feature was a series of games unlocked after completing some toolbox worksheets. One game "Pick-a-Bin," is similar to Fruit Ninja [8]. The other game, Traverse, is similar to "Flow" [8]. These games use answers given from the toolbox in gameplay, such as identifying potential triggers [8]. Study participants used the app for an average of 17 minutes, with some using the app more than others [8]. While the data is promising, the feedback highlighted key barriers to access, including unstable internet access, that must be addressed before an app similar to *Bridges to Sobriety* can reach larger markets.

VI. CONCLUSIONS AND FUTURE WORK

Alli is a goal-oriented substance misuse prevention app that aims to help its users by reminding and motivating them to adhere to their rehabilitation plans. Alli incorporates abstinence goals with personal goals and combines multiple features under one roof. The key features that Alli provides are goal-oriented abstinence tracking, mood tracking and virtual support groups. In the future, we aim to incorporate notifications and better authentication. We also identify its potential use in analyzing how mood can impact a person's susceptibility toward substance misuse. However, this would require large scale usage of the app.

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