



Life is what happens when you
put down your phone

Health & Computation

Cornell University

Professor Tanzeem Choudhury

Ph.D., Media Lab, Massachusetts Institute of Technology

Mobile Health (mHealth) is the practice of public health and clinical practice through the use of mobile devices.

The marriage of widely deployed **sensing technology, data science, and user interfaces** will transform healthcare through the use of novel sensors and computational tools.

The Process

1. Brainstorm and decide on a topic
2. Research and analyze all background information including prior research, literature reviews, and existing technologies.
3. Survey students to get a perspective on how the trends compare at Cornell.
4. Design and implement the app based on all information gathered thus far.
5. Design the user study and recruit participants to test the app.
6. Conduct a 3-week user test on the app.
7. Perform an exit interview on the participants.
8. Analyze the data and findings.
9. Write the project research paper.

Concept Statement

The cell phone has become a computer...
containing many of the same functionalities at an easy grasp.

College students are the most populous and frequent users and are spending anywhere from ***eight to ten hours*** a day actively engaged with their cell phones.

Experts refer to the overuse of cell phones as an **addiction** that can lead to serious implications in ***academics, social, and health***.

We sought out to increase awareness of real-time phone usage in order to encourage and motivate users to put down their phones, engage in new experiences, decrease cell phone usage, and improve certain aspects of their lives.

Background Information

What is the Problem?

The use of smartphone applications is one of the biggest contributors of unhealthy habits and behaviors among college students.

Smartphone users are oftentimes unaware of or incorrectly estimate how much time they spend engaged on their phones.

Research Shows...

When a smartphone user crosses the threshold from being **productive** to **counterintuitive**, cell phone use will have negative effects on the student's academics, social interactions, and fitness.

Cell phone use occurs mostly during class time or while studying. On average, about **95%** of university students will use their cell phones during a class setting on average **7** times per class

Students exhibiting high frequency cell phone use are experiencing additional negative effects connected to psychological behaviors, such as ***anxiety, social isolation, low self-esteem and satisfaction with life, shyness, stress, and lack of emotional and social skills.***

Hypothesis

**Increase
Awareness**

**Decrease
Use**

**Improve
Productivity
& Health**



Inspiration – Design Research

B.J. Fogg

Persuasive technology is the use of technology to attempt to persuade users to shape, reinforce, or change their behaviors. A change in behavior can only be done if the user is **motivated** sufficiently, has the **ability** to perform the desired behavior, and there must be some sort of **trigger** that will prompt the behavior change.

Bruno Latour

Social technology can shape human behavior by providing a the mechanism that **intervenes**, **motivates**, and **reinforces**. In order to successfully solve a problem of shaping human behavior, work has to be delegated to technology.

Carl DiSalvo and Jon Froehlich

When designing UbiFit and UbiGreen, respectively, both focused on the design of mobile phones that produced **interactive displays** to give their users **feedback** and reveal information about their **behaviors**. Visualizing information about behaviors raised awareness to the users about their behaviors and motivated them to change behaviors in order to change the display.

Application Overview

Curb

Curb consists of 3 major components

- Background Notifications
- Curb Mode
- The Clouds

Each component reminds the user of their phone usage in a different way, from a different angle.

Background Notifications

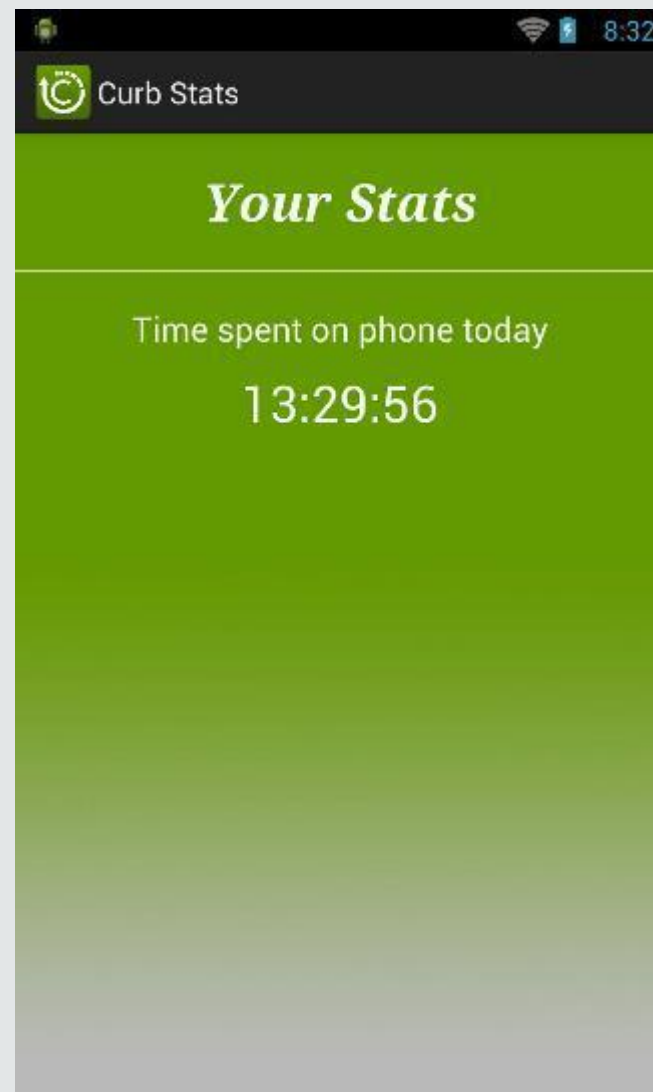
For **gentle reminders** about regular phone use.

Curb Mode

For **extended periods** of concentration.

The Clouds

For **tracking overall use** throughout the day.



Background Notifications

The purpose of the **Background Notifications** is for users to *increase awareness* of their usage in real time as they use their phone, primarily to prevent unconscious long periods of use.

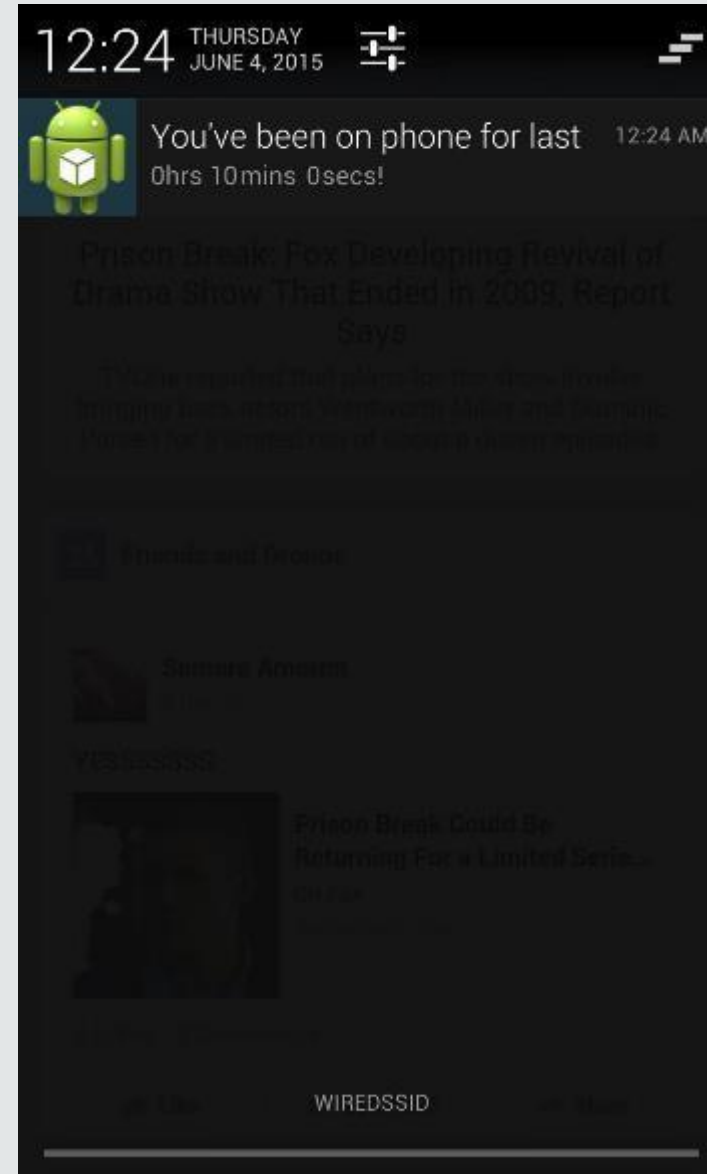
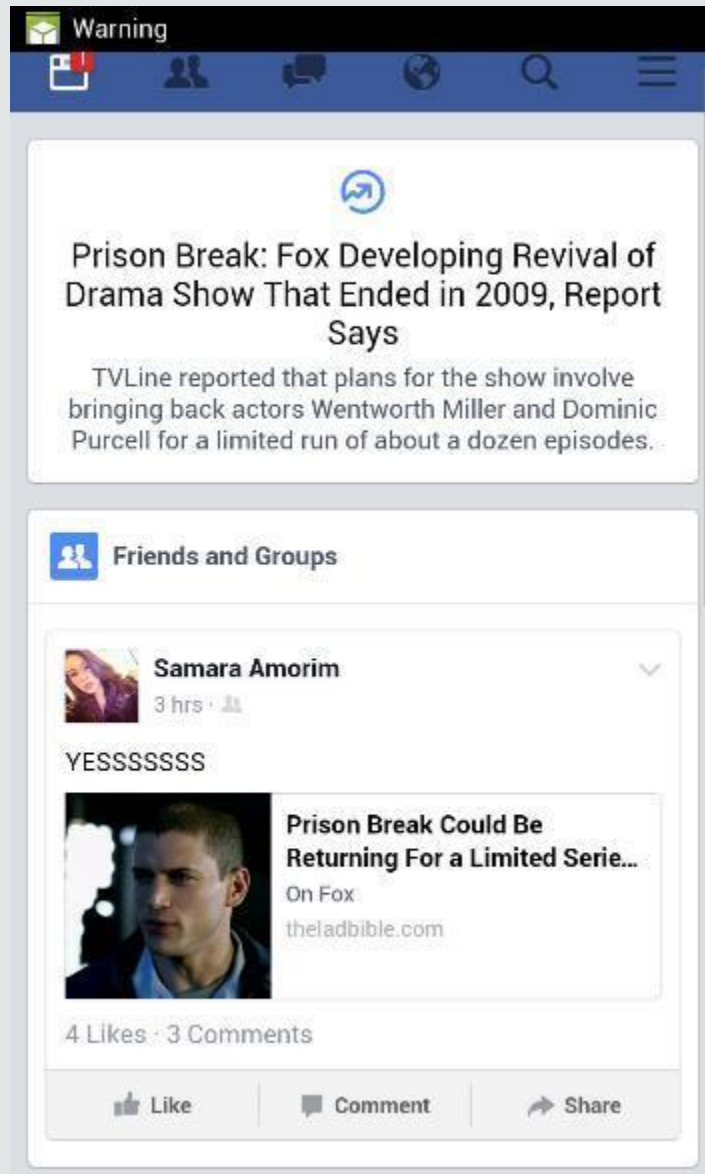
A new session tracker is created every time the user unlocks their phone.

For every **10 minutes** that it remains unlocked, the app will notify the user through a push notification

"You have used your phone for X minutes"

This feature is designed to be gentle so that users don't become irritated or ignore the notifications altogether, but are still becoming aware of their phone use.

Notification After 10 Minutes



Curb Mode

Curb Mode is designed to be more aggressive and is meant to be used for times when the user wishes to **prevent** themselves from using their phones altogether...

such as in class, at meetings, while studying, or during meals.

The feature can be toggled on and off on the home page of the application.

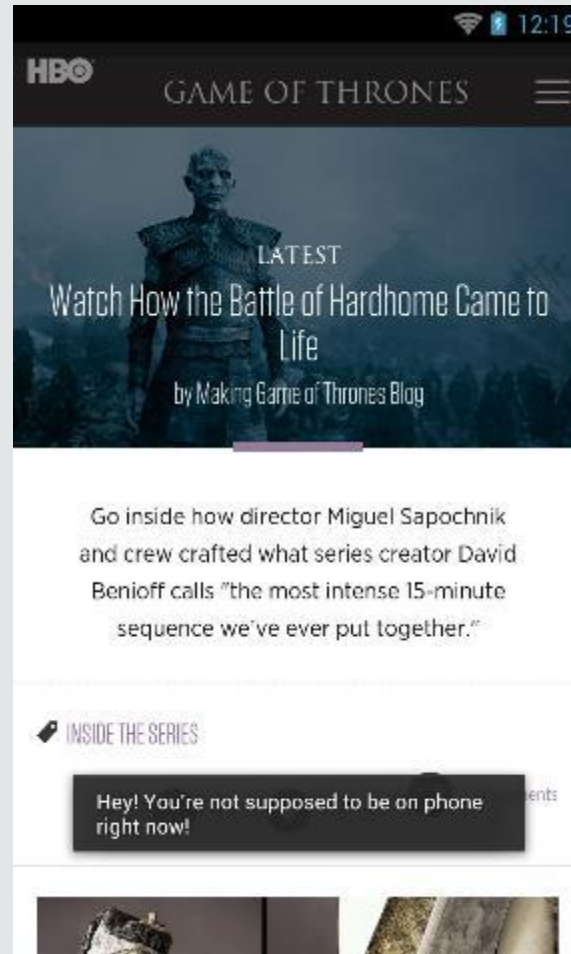
When **on**, a notification will appear the moment the user unlocks their phone, reminding them they should not be using it.

If they choose to ignore the notification, they will continue to receive push notifications every **2 minutes** until they lock their phone or turn off Curb Mode.

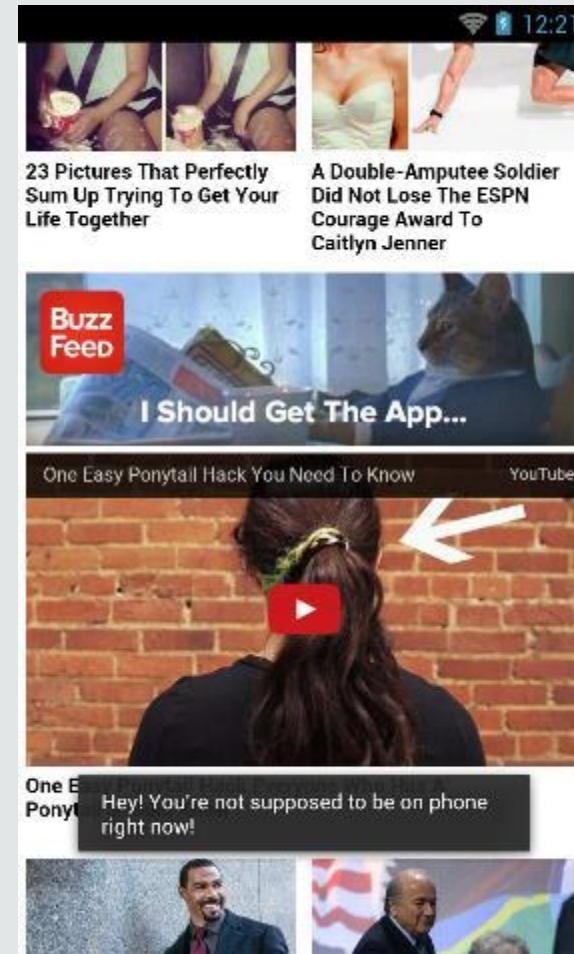
Curb Mode Started



First Alert After 2 Minutes



Second Alert After 2 More Minutes



Curb Mode Stopped



The Clouds

The Clouds feature a series of images that appear on the home screen of the user's smartphone used to **track phone usage** throughout a **24-hour period**. They provide a visualization that tracks hours of phone usage to provide a small and gradual incentive towards minimizing their usage.

At the beginning of the day, there is an image with clear skies.

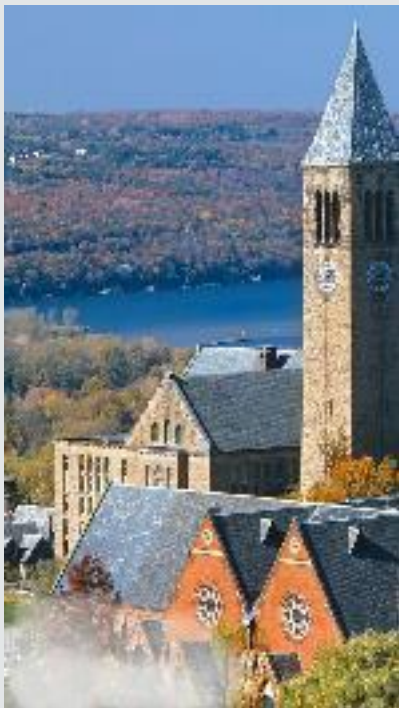
After 2 hours of phone usage, clouds will begin to appear on the background.

As the user's phone usage increases throughout the day, more clouds will appear and become darker in **2-hour intervals**.

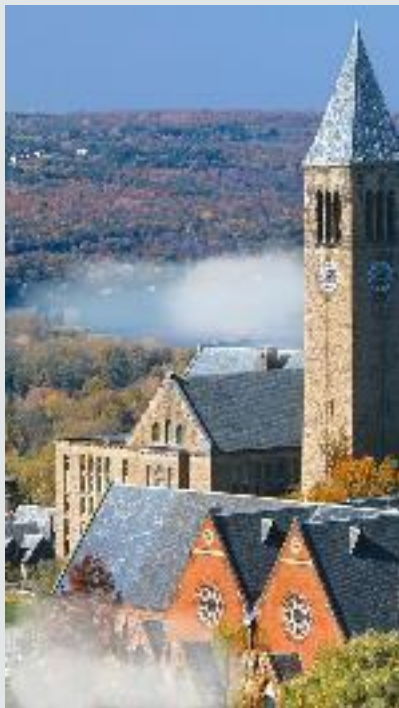
0 hours



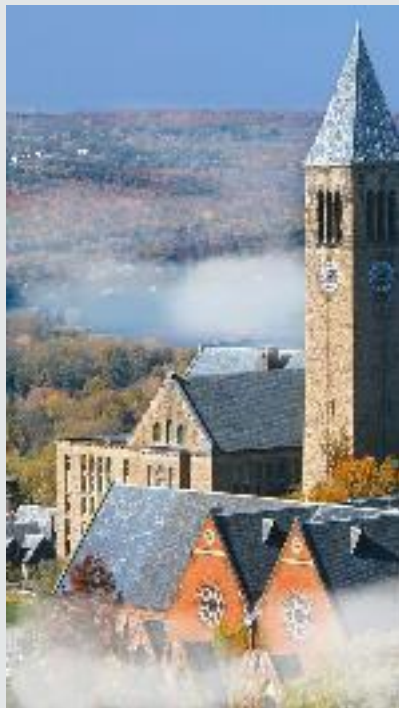
2 hours



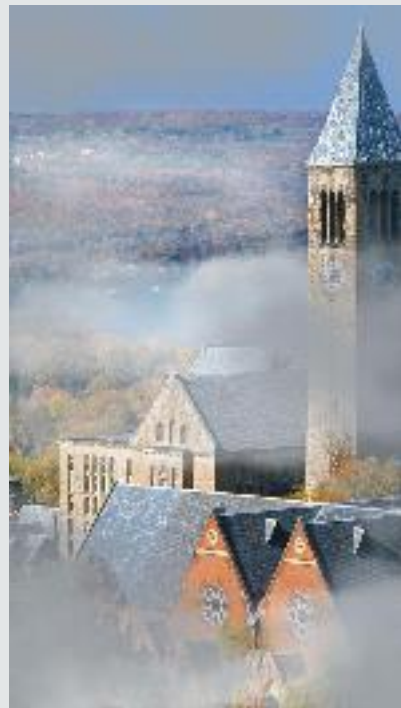
4 hours



6 hours



8 hours



10+ hours



Evaluation Study

Study Components

1. Entry Survey
2. Control Test
3. Mid-Study Habits Survey
4. Full Application Test
5. Exit Interview

Entry Survey

The **Entry Survey** was conducted to **understand phone usage** among Cornell students and **recruit participants** for the user tests.

We hoped to gauge both the necessity of and an interest in an app such as ours, and to pinpoint specific problems or details that we could focus on during application development and testing.

The survey was given through Google Forms, and advertised through various Facebook groups and Cornell list-serves. The prerequisites for taking the survey were (1) must be a full time student at Cornell and (2) must own a smartphone.

Curb

Life is what happens when you put down your phone.

Do you find yourself spending too much time on your cell phone?



Curb will encourage & motivate you to put down your phone and focus on the real world.

We are currently recruiting user study participants

Take a quick survey at: tinyurl.com/CurbCornell

Curb

Life is what happens when you put down your phone.

Graduation year *

Degree type *

BA, BS, M.Eng, etc.

Major(s) *

Minor(s)

Do you own an Android smartphone? *

- ☐ Yes
- ☐ No, but own a different smartphone
- ☐ No, don't own smartphone

Do you use your phone on a daily basis? If yes, what activities do you usually do on your phone? *

e.g. What applications do you use?

Do you consider your phone one of the major distractions when at times when you need concentration? *

e.g. in class, meetings, movies, driving

- ☐ Yes
- ☐ No

If yes, can you describe how your phone acts as a distraction (what do you do on your phone? How many times do you check it?)? If no, why not? What do you consider the major distractions? *

How many times do you surf your phone for longer than 10 minutes each day? *

If you are not sure, please give your closest estimate

Are there any particular times of the day that you do this? *

Have you ever used a productivity/time management application? If yes, which one(s)? *

Would you be interested in an application that tracks your phone usage and reminds you when you spend too much time on your phone? Why or why not? *

How would you feel about an application that reminded you that you shouldn't look at your phone while in class? *

1 2 3 4 5

Strongly dislike ☐ ☐ ☐ ☐ ☐ Strongly like

If such application existed, rank the below reminder notifications from most pleasing to you (1) to least pleasing (5): *

	1	2	3	4	5
Hey [your name], you should get off your phone!	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hey [your name], you've been using your phone for 10 minutes, you should get off!	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hey [your name], just letting you know, you've been on your phone for 10 minutes!	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10 minutes have been spent on phone.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personalized message.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Can you explain why you chose the number above? *

Would you be interested in participating in a 2-week research study that tracks your phone usage habits? *

Requirements: 2 interviews, download 2 apps, and actively use 1 of the apps.

- ☐ Yes
- ☐ No

Submit

Entry Survey Results

We were able to collect **53 responses**, and selected **14** to complete the rest of the study.

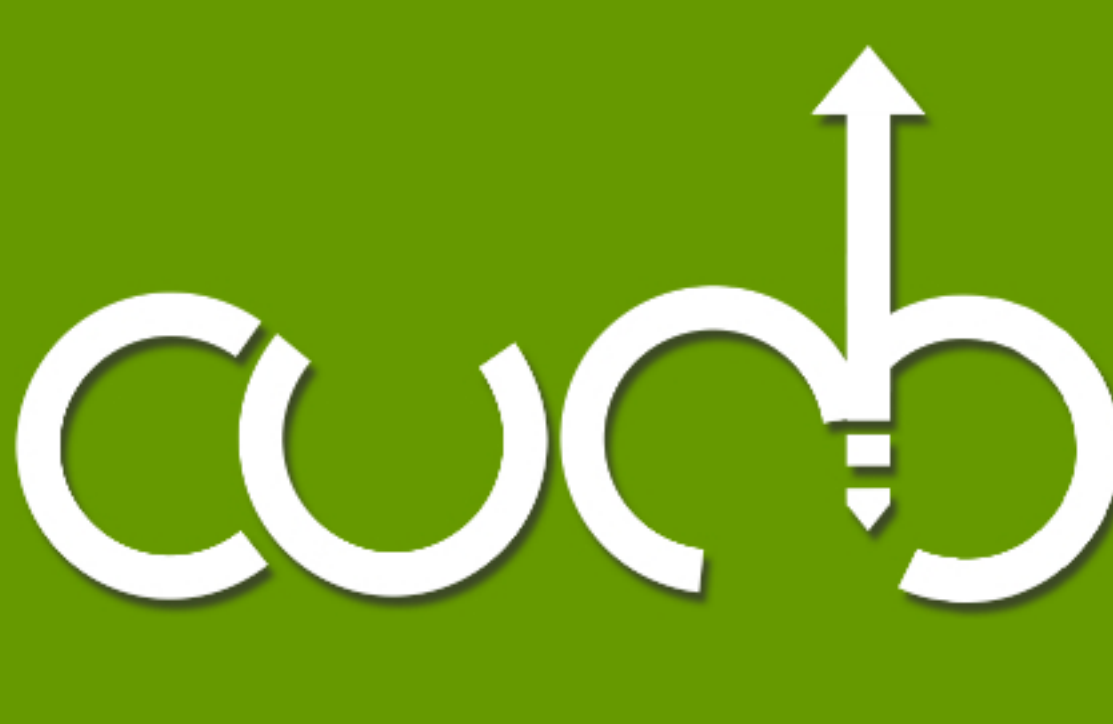
Selections were based on:

- Willingness: asked through survey question
- Type of phone: must be Android
- Area of study: to ensure a diverse group in terms of major and year

Entry Survey Key Findings

- Most participants consider phone to be a **major distraction**.
- Recognized that too much usage distracts them from their everyday lives.
- Most distracting activities reported were **social media and messaging**.
- Key usage times were **before bed, waking up, in class**.
- Many had negative opinions towards usage tracking apps, don't want to be reminded of bad habits.

The following infographic summarizes the entry survey results and findings.

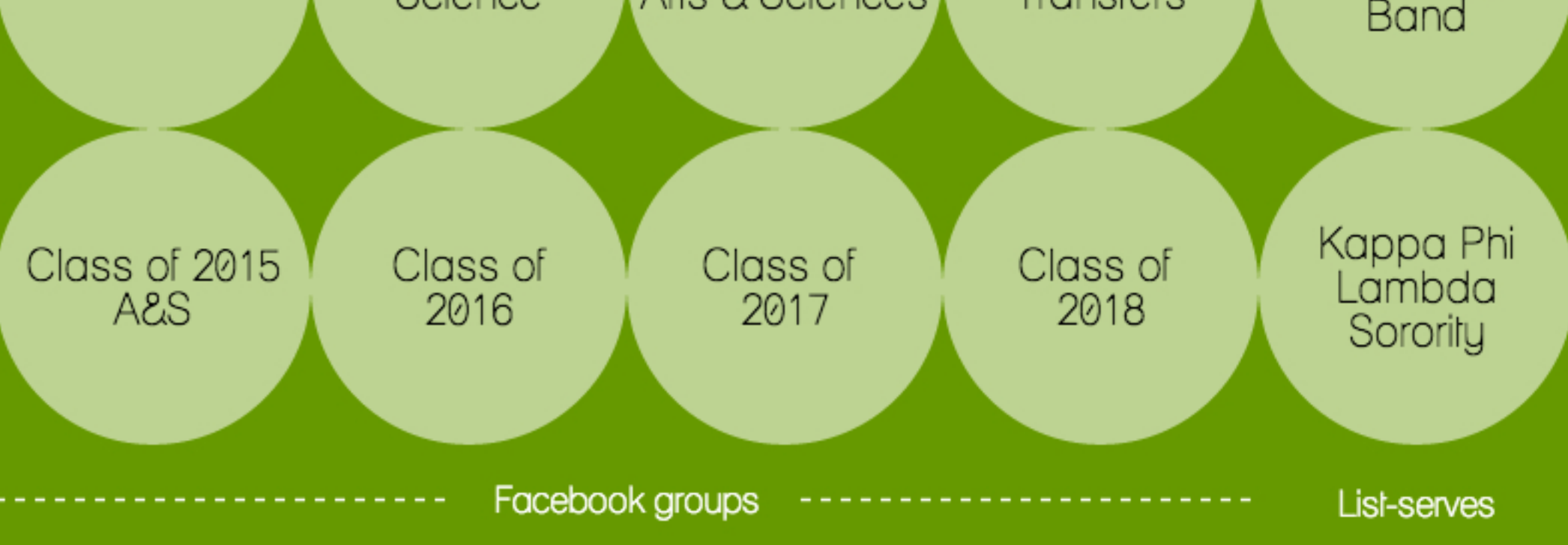


Entry Survey Data Analysis

tinyurl.com/CurbCornell

Electronic survey with the purpose of gaining a sense of smart phone app usage among Cornell students and to gather participants for the user study. Must be a Cornell student to complete the survey.

advertised to:



Survey Results

50* total responses
50 say "I use my phone on a daily basis"

Demographics



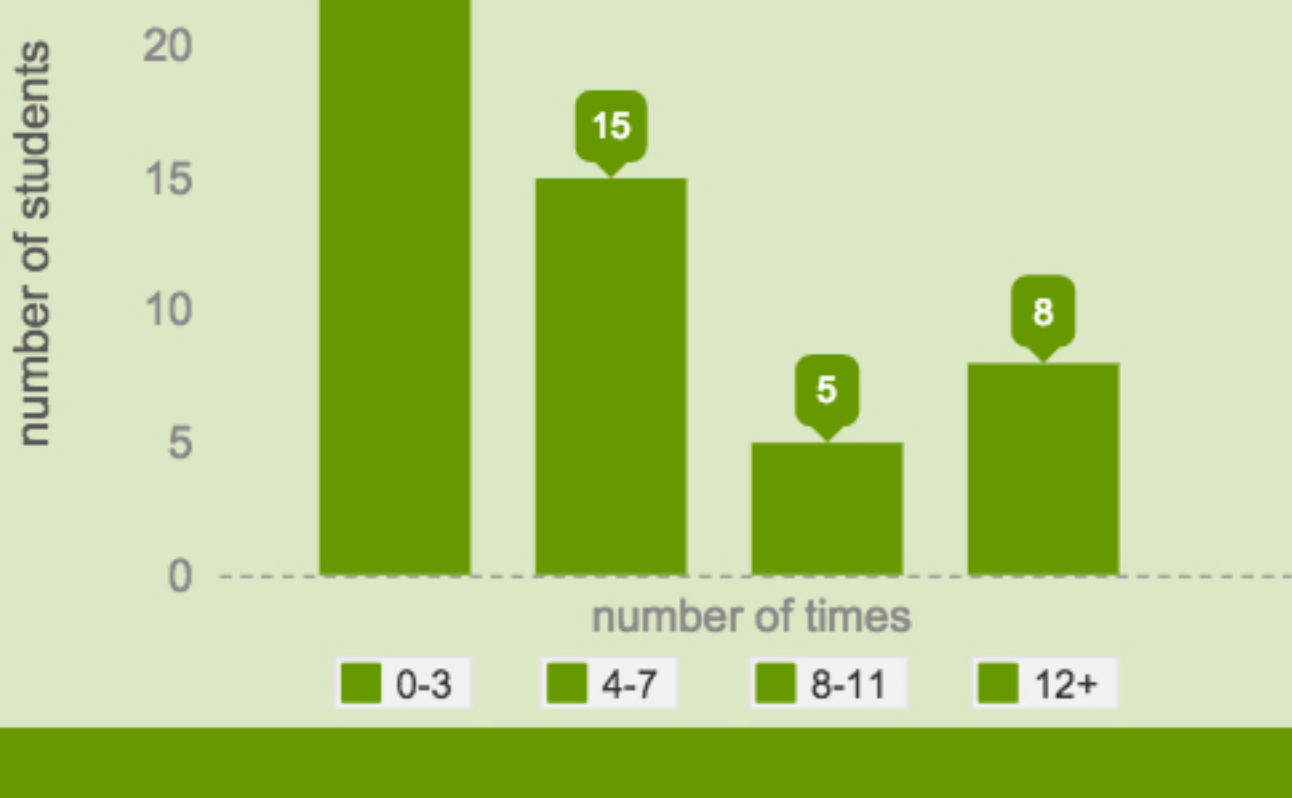
Is your phone a major distraction when you need concentration?



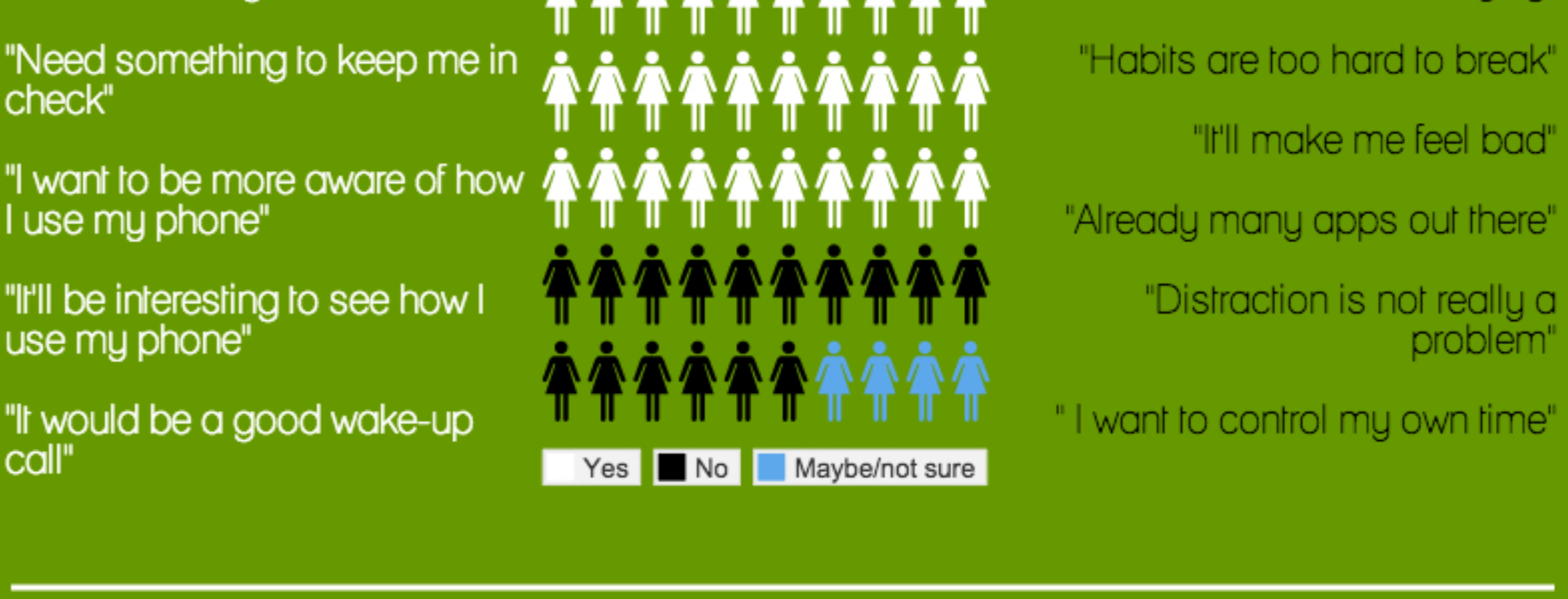
What are the most distracting apps?



I use my phone for longer than 10 minutes...



I am interested in an app that tracks my phone usage and reminds me when I spend too much time on my phone.



Take-aways

Most students agree that their smart phones are distracting. They recognize that too much usage distracts them from their everyday lives, and would like to try to fix their habits. Therefore there is a space available for Curb to meet the needs of its target market.

Keep in mind during the user study:

- A large number of students surf their phone first thing in the morning or right before bed at night. Can background reminders from Curb help students go to sleep and start their days earlier?
- Some students don't believe smart phones are distracting because they can control themselves and ignore their phones when doing important activities. Over time, can Curb train students to use their phone less without the help of notifications?
- A trending problem unique to students is phone usage during class. Will students be motivated enough to turn on Curb mode in class? How will turning on Curb mode affect students' attitudes towards their in-coming notifications and messages during class? In turn, how will the presence of these messages affect the students' views toward Curb mode?
- Some students expressed negative opinions towards usage tracking apps because knowing the data would make them feel bad about their habits. Will the cloud wallpaper, which lightly punishes over-usage, have this affect on the users?

After the close of the Entry Survey, 14 participants were selected and have continued with the User Study.

*Total 53 responses, but 3 did not own Smartphones and were therefore directed to the end of the survey after filling out basic demographic information.

Control Test

The **Control Test** measured the participants' **phone usage before being exposed to Curb** by gathering phone usage data that would be compared to the data collected during the application testing phase and then used to analyze the effectiveness of Curb.

Participants were instructed to download **RescueTime**, an app that tracks time spent on apps and websites and gives detailed activity reports and data.

The test was conducted in a **one-week period**, giving us 7 full days or one full week's worth of phone usage data. Participants downloaded the RescueTime application and used their phones as they normally would.

Control Test Results

Excluding two outliers of 1.77h and 48.13h, the average usage for the week was 16.74h (18.79h including outliers). Average usage per day was 2.38h (2.68h including outliers). There was no recognizable trend in usage among participants per day.

This is **much lower** than the 8h per day that we originally predicted through research and used in the development of our application.

Mid-Study Habits Survey

The **Habits Survey** was used to gain a deeper insight into **smartphone habits** of the participants that were going to test the app and obtain the data that would help explain the study results.

We hoped to measure the **degree of reliance** each participant felt towards their smartphone, and their ability to estimate their **current phone usage**.

The survey consisted of two parts.

- 17 statements about specific cell phone use habits and to what extent the participants agreed or disagreed with each.
- Provide the top 5 apps used the most and an estimate of (1) **how many times** they access the app and (2) the total **amount of time spend** on the app in one day.

Pre-Study Participant Survey

To what extent do you agree with the following statements?

I frequently check my phone to see if I have received any messages, emails, text messages, etc. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I experience phantom vibration symptom. *

Phantom vibration symptom is the sensation and false belief that one can feel one's mobile phone vibrating or hear it ringing, when in fact the telephone is not doing so.

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I experience anxiety if my phone is not on me, it has run out of battery, or I do not have access to it or an internet/wifi connection. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I experience a sense of satisfaction after using my phone. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I experience a sense of guilt after using my phone. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I try to reduce or limit the amount of time I am on my phone. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I have experienced failure when attempting to not use my phone for a given period of time. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I frequently use my phone when engaged in a social setting. *

i.e. social gatherings, family gatherings, at dinner, in restaurants, etc.

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I carry a phone charger with me. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I get annoyed or angry when somebody interrupts me while I am actively engaged on my phone. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I pretend to be making a phone call, texting, writing an email, etc. to avoid interacting with people or to avoid certain situations. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I have had family members and/or friends approach me with concerns about the amount of time I spend on my phone. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I choose to spend time on my phone over spending time with friends. *

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

Cell phone use/overuse has undermined my academic or work performance, either in the classroom or while studying. *

- ☐ Strongly Disagree
☐ Disagree
☐ Neither Agree nor Disagree
☐ Agree
☐ Strongly Agree

Cell phone use/overuse has negatively affected my physical health or fitness level/performance. *

- ☐ Strongly Disagree
☐ Disagree
☐ Neither Agree nor Disagree
☐ Agree
☐ Strongly Agree

I choose to spend time on my phone over physical activity. *

i.e. going outside, spending time outdoors, going to the gym, working out, etc.

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

I choose to spend time on my phone over socializing. *

i.e. participating in social activities/gatherings, going out, etc.

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often

Study Participant Survey

List the top 5 applications you use on your phone and provide an estimate on the amount of times you go on each app and the total amount of time you spend on each app in one day.

Application

App name: *

Amount of times app is used: *

Total amount of time spent on app: *

Submit

Mid-Study Habits Survey Results

Most participants **did not feel** that they were dependent on or over-engaged with their smartphones.

Participants check their phones very often for **texts, emails, and social media**. However, they did not feel that their phone usage affected their academic performance, physical and emotional health, or fitness.

Participants overestimated their usage of specific apps by an average of 68.7%

Facebook:

Estimate: 1 hour

Average daily use: 21.4 minutes

YouTube:

Estimate: 30 minutes

Average daily use: 7.5 minutes

Results showed no signs of addictive tendencies or cell phone overuse.

Application Test

The **Application Test** determined how effective the functionality and performance of our application was in **increasing awareness of phone usage, decreasing cell phone overuse, and increasing productivity.**

Curb was installed onto the smartphone of each participant upon completion of the Habits Survey.

Data collection continued through RescueTime for a **2-week period.**

Two application updates were made during this time period, one on the second day of the test, and the other on the fourth day of the test.

Application Test Evaluation

We evaluated the performance of the application based on:

- Does phone usage decrease with the use of Curb?
- Are users satisfied with Curb?
- Do users feel they are more aware of the time they spend on their phone?
- Is Curb Mode an actively used feature?
- Do any of the features produce negative mood effects?

Application Test Results

Week 1 showed an average decrease in usage of 4.17% while Week 2 showed an average decrease of 12.32%, with an overall decrease of 8.25% averaged over the two weeks.

There was **no substantial usage decrease**. Potential factors for this include:

- The testing period of 2 weeks was too short.
- Our group of users did not have serious phone addiction tendencies to begin with.
- Slight technical issues in the application skewed the results.
- There was not enough incentive to use and engage with the application.
- Our methods are not effective in encouraging behavioral change.

Exit Interview

The goal of the **Exit Interview** was to **debrief users**, as well as collect their thoughts on the study and the application, gather suggestions to improve the app, and wrap up the study for all participants.

Interviews were given **in person** the day after the Application Test to ensure that the experience was still fresh for all participants.

The interview focused on participants' experiences with as well as their perceptions of effectiveness of the application's three main components.

Of the 14 participants we selected to test the app, **9** were able to follow through and complete the rest of the study.

Introduction

Tell us about how the app worked for you.

How often did you receive notifications?

Did you ever see clouds? When?

Any other strange/buggy things that happened?

Discuss data collected and compare to control study.

Did phone usage decrease?

Did you feel that the app was effective?

Did you feel a conscious decrease in usage?

Do you become more aware of the time you spent on your phone?

Did your need for the app to remind you decrease over time?

Are now better able to predict how long you have spent on your phone?

Tell us about the Background notifications.

How many times do you estimate these notifications appeared per day?

How many times did they appear per sitting?

Did these notifications affect your mood?

Did you feel that they were effective?

Did it surprise you when the notifications appeared?

Did you know you had already spent 10 minutes on your phone?

Do you feel that the period of 10 minutes is appropriate?

If no, what would be a more helpful period for notifications?

Any other suggestions for the Background notifications?

Tell us about Curb mode.

When did you usually use the Curb mode, if at all?

If never, why not?

Did you feel that the notifications were intrusive/bothersome?

Did they affect your mood?

Did you feel that they were effective/needed?

If possible, would you change the message displayed and to what?

Any other suggestions for Curb mode?

Tell us about the Clouds.

How did you feel about the animation in general?

Did the change in animations throughout the day affect your mood at all?

Did you find the animation intrusive? Effective?

How often did you check the Clouds at the end of the day?

How often, after seeing the animation, did you go into the app to see your usage log for that day?

Any other suggestions for the Clouds?

Tell us about your overall opinions/experience with the application.

How did the interface feel?

Were you confused by anything?

Was there any function/page you rarely/never used?

Would you continue using this app in the future? (assuming fully functional)

General suggestions?

Exit Interview Results

The biggest trend resulting from the Exit Interviews was that the application features **did not negatively affect** people's moods, and therefore were not as effective in encouraging behavioral change.

Participants did become **more aware** of how long they spent on their phone. Behavioral change may occur over time with longer and more frequent use.

Although the Clouds were meant to decrease phone usage through negative reinforcement, most participants did not find that the Clouds affected their mood.

Our participants had lower usage than what we researched to be the average and used to set the visualization intervals. They did not experience the full extent of The Clouds as they did not use their phones enough to cause significant changes to the screen.

Thank You!