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# Lockbox - Reducing Smoking Habits through Positive Reinforcement

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## Abstract

Overcoming addiction is difficult. Smoking is a dangerous and unhealthy habit that can induce strong physical and psychological attachments. Quitting smoking is a multifaceted, difficult, and understandably slow process for smokers, who must weigh in their goals, reduce temptation, find support, and maintain consistency over a long period of time.

To facilitate the quitting smoking journey and improve the quality of life of its users, Lockbox is a mobile application with a Bluetooth-enabled cigarette box accessory that affords smokers a comprehensive way to monitor their smoking-related health metrics, curb impulses, and engage in a supportive community.

## Introduction

Smoking is a dangerous and unhealthy addiction that close to a third of college students [5] do on a regular basis, especially international students.

We want to solve this problem without the use of scare tactics and blatant facts, but rather use research-backed motivation and positive reinforcement to support and assist those who want to quit. Our team aims to design a new human-computer interaction to help the community of smokers who want to reduce and quit their addiction.

## Literature Review

All SIGCHI submissions should be US letter (8.5x11 inches) and not A4. US Letter is a standard option on all versions of Microsoft Word, as well as most other document preparation programs.

## Contextual Interviews

Our initial task was to formulate a set of needs that will engage our target community: college-age students hoping to quit or control their smoking habits. We interviewed six undergraduate and graduate students,

all of whom at some point had a regular smoking pattern of at least one ( $\geq 1$ ) cigarette per day.

Each interview took about 20-45 minutes. One interviewer and one note-taker met the participant in a casual setting of their choice. Our questions aimed to identify cues that perpetuated smoking patterns, successful or unsuccessful quitting strategies, and societal influences on their smoking habits.

Most participants mentioned the need to stick to a regular cycle as the source of their smoking pattern (e.g. needing to smoke after dinner, needing to smoke while walking to class). Three participants reported physical fixations, such as the need to hold a cigarette in their mouth or hand. One reported experiencing nicotine withdrawal symptoms whenever schoolwork stressed them out.

All participants cited willpower and cold turkey as the most effective quitting methods, yet five out of six participants blamed themselves for not having the strength to quit. One-time distractions and inconveniences, such as misplacing their cigarette box, could temporarily break smoking patterns for participants with fixations.

Participants agreed that negative ad campaigns were largely ineffective motivators for quitting. Participants already knew that "smoking was bad" for them, but didn't personally connect to the ad's message.

## Interview Analysis

From the contextual interviews, ( $\geq 60$ ) activity notes from compiled field notes were bucketized into an affinity diagram (Figure 1). Six categories emerged through synthesizing the raw data from the interviews: Starting, Habits, Motivational Ads, Social, Quitting, Consequences. These categories were used to inform a persona for our target user and design requirements.

Our findings indicate that those who wish to quit often have unique physiological or psychological triggers to



keep them smoking at regular intervals. Overall, our participants' smoking habits fall into the categories of schedule (aiming to finish a certain number of cigarettes per day or having a certain time or location for smoking), social (social environments, smoking with friends, peer pressure, cultural norms), physical (cravings for the oral fixation of having a cigarette in their mouth or for simply holding a cigarette in their fingers to satisfy "idle hands"), and state of mind (bored, intoxicated, overriding dopamine reward system).

Almost all participants expressed a desire or have attempted to quit smoking, and they largely agree that quitting hinges on individual willpower. Participants independently cited "willpower" as "the most important" and "hardest factor" about quitting, and needing "a strong motivation" for quitting. Health and social aspects were key motivators for quitting for some of our participants who are athletes or are seeking to elevate their careers.

Our participants converged on positive reinforcement strategies (e.g. distractions) as effective quitting techniques. Four out of six of our interviewees who all shared a similar view in that anti-smoking advertisements were not enough to motivate them to stop smoking.

Within our data, we found a variety of positive and negative reactions and consequences from smoking. For example, many subjects who found themselves addicted to smoking said they felt sharp and focused after having a cigarette. One subject even said that smoking helped with stress during recruitment season. However, these so-called positive elements of smoking come at the cost of negative consequences, many of which directly influence the person's desire to quit. Interviewees especially cited a lack of focus and general anxiety centered around a dependence on smoking. Their addiction influences users to continue using the drug to escape negative side effects like headaches and lack of focus, continuing the cycle of

negative consequences. Other interviewees cited health and environmental issues as consequences from their habit.

These findings informed our design's contextual requirements and functional requirements.

#### **Contextual requirements:**

- Discreet and positive branding: The system needs to be branded as a positive health and wellness system because many users are ashamed of their habit, and wouldn't want a "quit smoking" app on their phone for all to see.
- Ability to use system anywhere: The system should be easy to access and interact with anywhere because smoking habits are acted upon throughout the day and on-the-go.

#### **Functional requirements:**

- System should motivate through positive reinforcement habits that suppress the urge to smoke.
- The system shall promote the reduction of user's reliance, addiction, and habit of smoking.
- The system will suggest replacements for users' wired habits with something more beneficial to them to replace smoking.
- System should create a platform for people with similar struggles to share their experiences with one another.
- A way to track and monitor health levels related to smoking. This was one of the biggest reasons our interviewees wanted to quit, and giving users a sense of their progress or impact from their habit could incentivize quitting.
- A way for users to know what success stories and what has worked for other quitters.
- The system will educate users about their behavior and reward users who stick to their long-term goals.

#### **1. Persona**

##### **Archie Bryant**

Senior at Cornell University, Major in Business  
New York • 21 • Gemini

**Summary:** Archie is a career-motivated student who wants to do whatever he can to land a job at a successful bank. He enjoys spending time with friends, partying, and playing soccer with friends.



## **Ideation**

After sketching 20 different designs each, all six group members gathered to visually present their designs. To narrow down 120 designs, we entered our designs into a table, counting the number of times group members shared an idea. We merged similar ideas when possible, taking the best details from everyone's ideation and combining them to form synthesized ideas (Figure 3). We also rejected ideas that were technologically impractical or unoriginal.

Consequently, some of our strongest ideas centered around a physical pack to store the cigarette box and a mobile application that interacts with the box. Throughout the ideation process, we avoided having too many ideas packed into one application. From many variations of a mobile application, we agreed that a social network around the puzzle-oriented lockbox best matched our persona's goals. We were able to add the goal-oriented progress tracking and motivational aspects around this idea to make a compelling solution for our persona. To verify our synthesized design's originality, we looked up digital cigarette boxes and boxes with locks. Our searches found a partially funded project that used a smartphone app and cigarette container, but we strongly felt our design differs significantly from their solution. While both their and our design used the same hardware setup to put more resistance between wanting a cigarette and acting upon it, combined with social connections and motivational feature, we felt that our app puts the user first in helping reduce a smoking habit; using qualitative methods over quantitative data.

**Lockbox—Paper Prototype:** Our paper prototype modeled the locking cigarette box and accompanying mobile application, incorporating the features that would meet our user's most important long-term and short-term quitting needs. The long-term-focused features were a goal-setting and cigarette tracking system. This consisted of an onboarding process where

users could input their motivations for quitting or reducing smoking, and set daily, weekly, or monthly cigarette limits, and a dashboard page on the app including a graphic of users' weekly cigarette use and current progress toward their set limit, and a summary of their input goals, as well as motivation quotes and facts. This would allow users to visualize their advancement to quitting and provide further motivation. The prototype also included a social area where users could communicate in private messages or group chats to support one another in their journeys, as having a support network was important to our user group. To address users' immediate cravings to smoke and occupy their hands and mind, the prototype requires the completion of a short brain game on the app to dispense a cigarette from the box. Upon completion of the game, the app displays the user's quitting goals and smoking-related facts before presenting the option to unlock the pack, reminding users again of their own motivations to stop smoking.

**Initial User Testing:** We conducted usage tests of our paper prototype, drawing new candidates from our target user group. We observed how people interacted with the prototype (what they did, said, and expressed), and noted any feedback they provided. Our most common notes across user tests were the following:

- Social features were useful and should be expanded - customization of user profiles, chats with support professionals, progress sharing capabilities
- Dashboard display of metrics, facts, and goals was captivating and distracted users from smoking
- Visualization of progress through charts and graphs was a great positive motivator for quitting - users wanted to see even more personal smoking-related data, such as health and financial statistics

- The puzzles should not be too challenging as to frustrate users deter people from using the system
- Motivational quotes were tacky and unhelpful motivators

### **Low-Fidelity Prototype**

Our initial low fidelity prototype was closely resembled the paper prototype. We used gamification as the primary method to distract the user from their smoking habit. If the user felt the need to smoke, they could click the unlock button on the lockbox and be prompted to play a game on the app which increasingly became more tedious as the user approached their cigarette limit goal. After finishing the game, the user could play another game to continue the distraction, go to their messages, or unlock the pack to dispense just one cigarette. We additionally included a large social component within the app as well. Users could choose between a variety of groups through which they could chat with similar people to them, who were also on their own quitting journeys. Another social aspect that we incorporated based on feedback since the last design iteration was including direct messaging, so that users could speak with other users one on one rather than participating in large group discussions. Lastly, we made sure to include an area for users to view their progress and statistics over weeks and months of using the app. Including real graphs and data was important for users in helping motivate them to continue their quitting journey. We were then able to delete some of the motivational quotes that we had initially included, which users did not find as helpful. It is important to note that at every stage in the process we have avenues through which the user can resort to other supportive means rather than choosing to smoke a cigarette. However, it was also important to allow the user to smoke if they strongly felt the desire and fit into their weaning off goals.

### **Heuristic Evaluation**

Each team member then independently examined all the screens in the Balsamiq prototype and compiled five potential usability problems according to Nielsen's ten design heuristics. We then fused all our lists into a single Excel spreadsheet, eliminating duplicates. We rated the resulting 25 design breakpoints by severity and proposed a fix for each on a scale (1-4).

In the Balsamiq prototype, we found major issues regarding documentation, visibility of system status, and error recovery. We neglected to give instructions for our games, which is great if the player needs to solve a simple maze, but catastrophic if they've never seen a sudoku puzzle. The phone app also gives no indication of the status of the Lockbox (e.g. Is it unlocked? Is it out of cigarettes?). The app could falsely report that the user had it cigarette if it failed to dispense or if the box was empty.

Minor issues included inconsistent back buttons, the lack of a navigation bar, and unclear metrics diagrams.

### **Acknowledgements**

We would like to thank Professor Gilly Leshed and the HCI Design course staff for guiding us throughout the major steps of Lockbox's development. We'd also like to thank our participants who took the time to test our prototypes, provide insightful feedback, and inspire the next round of designs.

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