Design of a Device to Help Severely Mentally Ill Patients Quit Smoking

Product Design Specifications

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Problem Statement

To design a case for holding cigarettes that is augmented to specifically help people with severe mentally illness(SMI) quit smoking. The case will house a sensor to detect if the user attempts to open the case, another sensor to detect whether the case was actually opened and a third sensor will be used to detect how many cigarettes were removed from the case. The data from access attempts will be continuously transmitted to the smartphone wirelessly. The data will be transmitted to the phone via bluetooth (v4.0) as serial characters coding for various responses to sensors. For example, the character 'a', would represent access to the case. The phone will detect access attempts, opening and closing. Each time the user accesses the case, the phone application will ask the user a series of questions about their desire to smoke, the environemental or emotional cue that prompted the urge, and to rate the salience of the urge. Overtime, the user will gain knowledge about their own use and will then be able to use skills (aquired via the application) to cope with not having a cigarette. One of these skills could be to do something else (play a video game, listen to music or do another activity the participant has indicated helps them avoid smoking) or remind them of the reasons that they want to quit (display a picture of their child, pet or loved one). In addition, the application will send daily updates to the subject and/or to any clinician or provider the subject specifies.

1. Client Requirements

- The case should be difficult to break and hold at least 20 cigarettes (should be modeled after the cases in current use).
- The case should have an onboard rechargeable battery.
- The case should unlock after a request from the participant via a push button after a specified time delay. Then the case will send this information to the cell phone application via Bluetooth.
- The system should interact (can be through phone) with the user to help track behaviors, beliefs, and urges around smoking and support coping skills. The electronic pack should lock for a time delay specified by

research on SMI patients who smoke. While the case is locked the subject is to engage in coping skills to delay and reduce smoking.
- The device and the application should be easy to use, with simple opening/closing mechanism, uncluttered interface on phone, simple text, minimal layers of navigation, minimal requirements for abstract thinking and memory.
- We should have a working prototype (five copies) done in Spring 2013.

2. Design requirements
2.1 Physical and Operational Characteristics

a. *Performance requirements*:
The device is required to be augmented for daily and frequent use. Severely mentally ill patients may attempt to access it in different time delays that vary from few minutes or sometimes few seconds in the case of severe addiction to few hours in less severe cases.

b. *Safety*:
The cigarette case should be developed for mentally ill patients so it should be totally safe and free of warnings because we cannot rely on the patient to take precautions.

c. *Accuracy and Reliability*:
The case should record and send reliable data about the access times the opening of the case and the number of cigarettes taken because this information can lead to faulty interpretations if it lacks accuracy. For example if the open button is pressed but the patient did not open the case because he controlled his urge but the data collected showed that the case was opened this will affect the treatment.

d. *Life in Service*:
This case should serve the patient for the whole period of the treatment and remain useful after the treatment is done for future uses. It should work in different countries and operate 24/7 but the battery needs to be recharged every 8 hours.

e. *Shelf Life*:
The battery that is included in the case should be a rechargeable battery for efficiency and ease of use and also because it is more environmentally friendly.

f. *Operating Environment:*
The cigarette case must adapt to different working environments. It can be exposed to different temperatures and different humidity ranges. It can also be exposed to dust, vibrations and accidental hits. We have to make sure that the accuracy of the data is not affected by those factors.

2.2 Production Characteristics
a. *Quantity*:
We should have five devices for the research purpose.

b. *Target Product Cost:*
The cost of this cigarette case will be higher than the cost of a normal cigarette case but it has to be a feasible price not above 100$. The case will be purchased once only and it can be refilled with cigarettes so this is an initial cost only.

2.3 Miscellaneous

a. *Patient-related concerns:*
The patients we are dealing with are mentally ill patients so extra considerations should be taken into account regarding the system so it is tailored to the needs of the users. The collected data should be confidential and provided only to a specified mentor, clinician and a system administrator.