Lit: A Game Intervention for Nicotine Smokers

Jessica Mezei, Nisha Alex, Azadeh Jamalian, Pazit Levitan, Jessica Hammer, Charles K. Kinzer
Teachers College, Columbia University

A Proposal Abstract (Accepted for Presentation)
at the annual meeting of the

American Education Research Association
April 30 to May 4, 2010
Denver, CO

Restricted Distribution—Do not Quote Without Written Permission

---

1 Support for this work has been provided by the Robert Wood Johnson Foundation. The opinions expressed are those of the authors and not necessarily those of the Foundation.
Lit: A Game Intervention for Nicotine Smokers

Objectives

This paper will present the conceptual basis and principles of an ongoing project to create and evaluate innovative and validated principles for educational health game design. The project to be reported focuses on the use of biofeedback measurements as a design technique to develop the game Lit as a self-regulated health intervention. Specifically, Lit is designed to help smokers reduce their smoking habits through the use of breath control as a game element. In particular, this study explores the possibility of utilizing breath control as a game element to provide players with an effective coping strategy that mimics the physiological effects of smoking. The target audience is smokers in their twenties and thirties with smoking reduction and/or cessation goals. Keeping in mind the unique needs of this population, we use theoretically grounded research in smoking cessation and evidence-based biofeedback measures for designing and implementing Lit as a self-regulated health game.

Theoretical Framework

In this paper, we present the educational health game Lit as an intervention for smoking behavior based on self-administered behavioral coping strategies and breath therapy research. Lit uses breath control as its central game mechanism and serves as an emotional and physiological self-regulation tool to help smokers reduce their smoking habits. According to the Robert Wood Johnson Foundation (2009), though tobacco use may have decreased, it remains the leading cause of death in the United States. Among adult smokers, 70% report that they want to quit completely, and more than 40% try to quit each year (World Health Organization, 2008). The game Lit helps these people to achieve their goal. Lit is designed to mimic the emotional and physiological effects of smoking by using the innovative game element of breath control alongside graphics, sound, and game-play. Nicotine's dual effects are as a perceived stimulant or a perceived sedative (Donovan & Marlatt, 2007). Lit reproduces these effects, as desired by the player, through its two modes of play: Rush and Relax. Smokers who are attempting to "quit" often experience desires for nicotine's effects, which physically-obtrusive supports such as nicotine patches attempt to mitigate. As an educational health intervention, Lit is being designed as something that withdrawing smokers can play and, through breath control built into the game, mimic nicotine's effects of stimulation or relaxation to address the desire for nicotine's effects without patches or other replacement drugs.

Breath therapy has been proven to be an effective intervention for reducing smoking (O’Connell, Hossein, Shwartz & Leibowitz, 2007). Deep inhalation during smoking promotes relaxation. However, people who stop smoking often do not continue such deep breathing and therefore experience increased tension. Breath therapy interventions for smoking cessation focus on guiding smokers in regulating their breath mechanism in a way that slows the pace of their whole body and therefore promotes general relaxation (American Lung Association, 2009). The breath interface in Lit allows greater scope for biofeedback effects that have been shown to be an effective intervention for smokers in other contexts by mimicking the physical behavior of smoking (O’Connell et al., 2007).

Further, research on different interventions for smoking cessation shows that behavioral coping strategies lower urge levels if they evoke effects similar to smoking (O’Connell et al.,
Different self-administered behavioral coping strategies have been studied, with positive impact on smoking cessation. However, a major drawback of these interventions is participants' low motivation to continue the process. Thus, new approaches are needed to motivate smokers to persist in the intervention and to support them throughout the process. Lit is expected to be an effective coping strategy that motivates smokers to adhere to the self-regulated process of smoking reduction.

Low motivation in quitting smoking could be analyzed through reversal theory (Apter, 1989). Reversal theory posits that people reverse back and forth between opposing telic and paratelic metamotivational states, characterized by a certain way of interpreting aspects of one’s own motivation (Apter, 1989). Based on reversal theory, a telic state implies serious minded, goal oriented, arousal-avoidant characteristics. In this mode, “pleasure comes primarily from the feeling of movement towards the goal, of progress and improvement, as well as from the attainment of the goal itself” (Apter, 1989, pp. 33). On the other hand, a paratelic state implies a playful, sensation oriented, spontaneous and arousal-seeking personality. In the paratelic mode, pleasure comes primarily from the activity and “from the immediate sensual gratification” (Apter, 1989, pp. 33). An understanding of these opposing states is significant in our study since research has shown that smokers in paratelic states are more likely than those in telic states to lapse when experiencing temptations (O’Connell, Cook, Gerkovich, Potocky, & Swan, 1990).

Another important aspect of reversal theory related to our study is the relationship between arousal level and hedonic tone. The graph in figure 1 illustrates such a relationship, with arousal level as the independent (ranging from low to high) and the hedonic tone as the dependent variable (ranging from pleasant to unpleasant). Based on this graph, excitement and relaxation can both be extremely pleasant (Apter, 1989), and what the individual wants could change radically as reversal occurs between the two opposing dimensions of relaxation-anxiety and boredom-excitement (Apter, 1989). This phenomenon could partially explain the act of smoking: nicotine can provide either a stimulant (relaxing) or a sedative (arousal) effect (Donovan & Marlatt, 2007), and smokers engage in the activity of smoking for either of these two effects. Furthermore, consideration of this aspect of reversal theory is important for designing a self-regulatory intervention for smoking harm reduction.

![Figure 1: Apter's Reversal Theory](image)

Smokers reverse back and forth between what they want (excitement vs. relaxation) and their metamotivational modes (telic vs. paratelic), and thus the self-regulatory tool should serve...
them to regulate their behavior in either case. However, most interventions address only one of these states. While they are effective in the telic metamotivational mode, they fail to engage smokers in the paratelic state. As a result, many participants lapse into old habits when motivated paratelicly. We hypothesize that a game has the affordances to support smokers in their paratelic states in two ways: (1) by evoking similar physiological feedback as smoking through the game-play, and (2) by offering a goal oriented yet playful framework.

In addition, games on mobile platforms allow players easy, everyday access to the harm reduction intervention. The mobile nature of the platform lets the game occur in contexts where players would ordinarily smoke: outside and/or during brief breaks in their daily schedule. By delivering the intervention in the same place as the behavior that players want to change, we expect increased effectiveness from the game (Godden & Baddeley, 1975). The game is designed for a mobile phone environment with a five-minute duration—the average time taken to smoke a cigarette.

**Game-play Mechanics**

The player must select a mode of play: Rush or Relax. Each mode features different graphics, sounds and game mechanics in order to evoke an aroused or relaxed state, respectively. In Rush mode, the player must quickly capture colorful specks of dust and gas to create stars, while simultaneously fending off black holes and other obstacles using breath control. The game is fast-paced and requires constant attention from the player. In Relax mode, the player matches their breathing to patterns shown on screen in order to bring life to a barren universe. The game is slow-paced and meditative, encouraging a feeling of relaxation.

**Methods and Data Sources**

The project’s research design has two phases: iterative design and development, and a health game design principles study.

In the first phase we focused on iterative design and development of the game using biofeedback measurements and play-testing/survey studies. At present, the initial prototype of the Rush mode has been developed and four rounds of intensive play-testing have been conducted. Accepted methods of play-testing have been used to obtain information about the game and players’ reactions to it. In particular, participants were asked for an overall evaluation of Lit, specific game elements they liked/disliked, and feedback regarding usability, interface, graphic and sound design. Some participants were asked to think aloud while playing the game, and comment on the game's pace, its difficulty, specific emotions they felt, and to provide additional comments.

We will support the data from play-testing/survey studies with additional biofeedback measurements. Still in Phase 1 and during Lit’s iterative design process, three sets of high-resolution electroencephalographic (EEG) measurements of biofeedback responses to game-play and smoking are being collected. Biofeedback responses (physical and subjective measurements) to the game events will be mapped into the circumplex model of affect (Russell, 1980), which represents emotions with two dimensions of arousal and valence. Responses to smoking will also be mapped on the same graph. The players’ responses to game events will be compared with that of smoking nicotine. The results will influence the design and development of the game’s mechanics and aesthetics to ensure minimal variation between the groups.
Additional playtesting/survey studies will be conducted after each prototype version of the game. The information obtained from these studies will be used to enhance the game design. Once the final, "gold" version of Lit is completed, phase 2 of the study will assess how effective the game is in evoking physiological reactions comparable to nicotine’s effect. Further, we will evaluate the physiological effects of the breath mechanism as a game element. To do so, high-resolution electroencephalographic (EEG) measurements of biofeedback responses to game-play, smoking and breath therapy will be collected using a randomized, controlled experiment with one control group and two experimental groups. The control group receives breath therapy, experimental group 1 plays the gold version of Lit with no breath element, and experimental group 2 plays the gold version of Lit with the breath game element.

In addition, using the gold version of Lit, a randomized experiment with one control group and one experimental group will play-test the game. Subjects in the control group will play Lit with no breath component, and subjects in the experimental group will play Lit with the breath component.

Results and Conclusions

At this point we have preliminary play-testing results. We expected that players would respond with excitement to the fast music and bright colors of the initial Rush design, and anticipated that players would find the cognitive challenge and breathing aspects of the game to be satisfying.

Results from play-testing show that players found the game to be engaging, giving them a sense of rush and excitement. They liked the “hyperventilating” mechanic and the use of color and sound. However, the game's pace was too fast in its initial levels, and the game tended to be too difficult for the memory and cognitive load of the player. These and other challenges (e.g. difficulty in discerning colors) are being addressed and will be reported. In addition, EEG data recordings for the alpha prototype of the game will be analyzed prior to AERA's annual meeting and will be presented.

Scientific and Scholarly Significance

We expect Lit to function as an effective behavioral coping strategy for smokers who wish to quit smoking. We also believe that our study can demonstrate the effectiveness of games for emotional and physiological self-regulation. This concept opens a new set of problems for resolution using game design. We also believe that Lit will promote the use of an underutilized game mechanism (breath control), which could open a new set of opportunities for educational health game designers.

The success of this study will provide game designers with a highly innovative, effective and beneficial approach to designing games to improve health. The core of this approach is the use of biofeedback measures in an iterative design process that informs decisions to effectively design a game for emotional and physiological self-regulation. Further, the study will provide evidence of the possible benefits of breath control as an interface and game element in educational health games.
References


