

Designing Mobile Applications for Smoking Cessation in New Zealand

Nilufar Baghaei¹, Lian Wu^{2*}, John Casey¹, Kathy (TeUrikore) Biddle-Ranga³

¹ Dept of Computing, Unitec Institute of Technology, Auckland 1142, NZ

² Dept of Community and Health Services, Unitec Institute of Technology, Auckland 1142, NZ

³ Kaihautu Mātauranga Māori, Unitec Institute of Technology, Auckland 1142, NZ

*corresponding author: {lwu}@unitec.ac.nz

Abstract. Tobacco is a leading cause of preventable death in New Zealand. The smoking rate for New Zealand Māori was 44 percent in 2009, still significantly higher than for non-Māori (18 percent) for both males and females. In this research project, a novel mobile application (*SmokefreeNZ*) has been designed and developed, which can provide two way interactions between the server and client, whereas traditional text interventions only provide one-way communication (from server to client). This novel approach integrates interactive Mobile Technology, Social Psychology, Persuasive Technology and Behavioural Therapy to deliver personalised content in both English and Te Reo Māori, which is designed to encourage and help individual smokers to quit smoking. It serves as a tool and platform to rouse and maintain the desire and motivation to quit smoking. It is also capable of delivering tailored multimedia content to smokers from different cultural backgrounds, and will provide a clear goal for the quit attempt, maintaining the salience and reward value of making progress towards that goal. It can also use evidence based methods of reducing the desire and impulses to smoke. Currently a case-controlled trial is undergoing to further investigate the effectiveness of the app as an intervention tool.

Keywords: Behaviour change intervention, e-health, mobile application, persuasive technology, smoking cessation.

1 Introduction

Smokefree Aotearoa New Zealand 2025 is an official Government goal. According to data from the Ministry of Health [1] tobacco is a leading cause of preventable death in New Zealand. In 2009 the current smoking rate for Māori was 44 percent, significantly higher than for non-Māori (18 percent) for both males and females. Māori in all age groups had higher smoking rates than non-Māori and Māori non-smokers were more likely than non-Māori to be exposed to second-hand smoke in their homes and cars. Māori were more likely to be asked by their health care worker

about their smoking status, and to have been referred to quitting programmes or given quitting products by a health care worker in the past 12 months, compared with non-Māori.

Research shows the main drivers of smoking become significantly reduced after a month of total abstinence. Based on the Theory of Motivation, successfully stopping smoking involves keeping the desire and capacity to inhibit smoking sufficiently high to override the impulses to smoke that can arise at any time following the start of a quit attempt.

Previous studies [2, 3, 4] have shown that text (Txt) message intervention (when smokers are sent text messages to support them while they are quitting) can help boost motivation and can significantly improve the success rates of smoking cessation. They also show that intervention feasibility was greatly improved by switching from traditional face-to-face support methods to Txt messaging.

Our proposed mobile app implements extra features, which we hypothesis will further improve the Txt message approach: 1) *SmokefreeNZ* will provide two way interaction between the server and client, whereas Txt interventions only provide one-way communication (from server to client). This intervention is similar to a face-to-face Approach, but without the limitation of resourcing; 2) The app is more likely to engage younger people than the Txt method, as young people are most likely to have access to a smart phone with social media apps; 3) *SmokefreeNZ* will provide interventions but will also be useful to monitor the progress of cessation. We will know if further or more frequent interventions are required, particularly within the first month of cessation; 4) The app can include elements of static text but also multimedia, such as video, music, cartoon and even games; 5) The app can be tailored to deliver materials to suit different cultural backgrounds (for example Māori or Pacific).

SmokefreeNZ will integrate interactive Mobile Technology, Social Psychology, Persuasive Technology and Behavioural Therapy to deliver personalised content in both English and Te Reo Māori which will be designed to persuade and help individual smokers to quit smoking. It will serve as a tool and platform to rouse and maintain the desire and motivation to quit smoking. It will be capable of delivering tailored multimedia content to smokers from different cultural backgrounds, and will provide a clear goal for the quit attempt, maintaining the salience and reward value of making progress towards that goal. It will also use evidence based methods of reducing the desire and impulses to smoke. The objectives of the project are as follows:

1. To develop a personalised app that is able to interact with a user's profile, showing them information pertinent to their choice to quit smoking (e.g health benefits, financial benefits, family benefits).
2. To improve the successful rate of smoking cessation by delivering tailored multimedia content direct to users' smart devices.
3. To collect smoking cessation data and perform a Mega-Data analysis to investigate different smoking cessation patterns in different cultural

- contexts, such as emotional and habitual addiction, motivations, desires and difficulties.
4. To investigate whether and how the app can help NZ smoking cessation practitioners (e.g. from Quitline¹) in their daily clinical practice.

2 Design of the mobile application & Pilot Study

In this phase we have defined the major functions and content of *SmokefreeNZ*. It can be broken down into the following three steps:

1. Define the main functions of the application and system architecture.
 - a. To deliver tailored multimedia intervention content to each smoker regularly to encourage, persuade, rouse and maintain their motivations.
 - b. To track every cigarette they smoke or resist; track all cigarettes as well as smokers' cravings; identify the moments of a day or week when the temptation is at its peak; identify the triggers which make them want to smoke the most; identify the places where they smoke the most.
 - c. To monitor their progress and share it with other friends (social network): how long a smoker has been a non-smoker; how many cigarettes smokers have smoked or resisted since they decided to quit or cut down.
 - d. To check the benefits on health and life expectancy; to see how long they have been smoke free; to see the money they have saved from not smoking.
 - e. To provide a "push service" to maintain their motivation.
2. Design the main interfaces, the approximate layout and structure of the application.
3. Decide on the appropriate computer language and platform (iOS or Android) and review the previous design. We have picked Android for this project.

Feedback is elicited at every stage of the design / development process and this feedback will be used to refine the final product. The application is developed with Te Reo Māori in mind first, and will be later translated into other languages. Finally, the application will be reviewed and tested, and further refined.

We have completed the development of the prototype app. The main aim of the functions provided are to deliver personalised information to encourage smoker to quit, encourage and improve engagement to use other quitting service, tell smokers

¹ <http://www.quit.org.nz/>

how many days they have been smoke free, show how much money they have saved daily and yearly from not smoking, show the number of cigarettes they have not smoked, show health benefits they regained, show trophies for their success and share their story with Facebook friends.

We implemented a prototype app in Android. Figure 1 shows a screenshot of the main page:

- **Life benefits:** provides information on benefits of being smoke free, such as financial benefits (amount of money saved daily, weekly and annually and achieving financial goal) and health benefits (heart rate, Oxygen level, reducing risks of COPD, cancer etc.).
- **Motivation:** provides general motivational material such as for present health, for finances, for job prospects, for appearance, for social needs and for others.
- **Extra Help:** provides links to other cessation agencies such as Quitline, Heart Foundation, ASH and NRT treatments.
- **Facebook:** provides links to our Facebook page.
- **Motivational Video:** can record users' own motivation video or display videos provided by administrators.
- **Account:** User profile and achievements so far (i.e. how long they have been smokefree) and pushing notice manage.

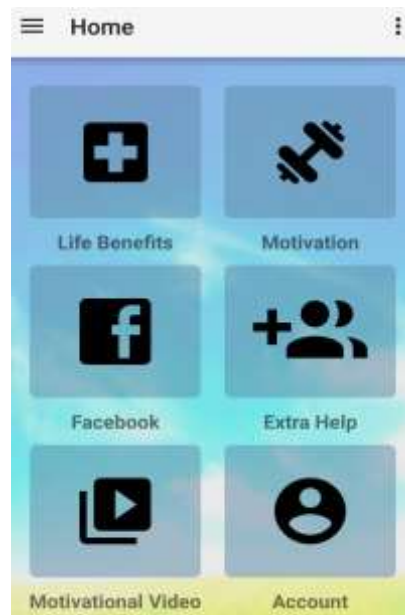


Fig. 1. Screenshot showing the prototype version of *SmokefreeNZ* Android app

A case-controlled trial (ethics approval registration number: UREC 2016 - 1011) will be soon conducted in local communities for 30 days. The primary outcome will be self-reported continuous smoking abstinence. In another word, we evaluate whether our proposed mobile application can improve the smoking cessation rate in current smokers. A questionnaire survey has been developed and will be used in our pilot study. Steps include:

- **Participants:** Smokers (from Unitec campus) will be recruited to participate in this study. To be eligible for this study, individuals have to meet the following inclusion criteria: (1) current daily smoker, (2) interested in quitting smoking in the next 30 days, (3) have a Android mobile phone (we will also provide some for the study).
- **Baseline Measures:** Smoking history variables will be assessed, including age when started smoking, current number of cigarettes smoked per day, number of quit attempts in the last year, and methods used to attempt to quit.
- **Outcome Measures:** Outcome measures will be administered mid-intervention (week 4), post-intervention (week 8), and at 3 months follow-up assessments.

Many activities on the app will be logged during user interaction and will be analysed after the trial, such as number of times the app is accessed during the day, time & date, duration of each session, the number of times each functionality is accessed, number of individual feedback messages displayed etc. Analysing the log data will help us examine whether the information displayed to the user will help them quit smoking in the long run. We believe our research paves the way for the systematic design and development of full-fledged mobile applications dedicated to improving the smoking cessation rate in Maori and general population.

References

1. Māori Smoking and Tobacco Use 2011. Wellington: Ministry of Health
2. West R, Stapleton J. Clinical and public health significance of treatments to aid smoking cessation. *European Respiratory Review*. 2008;17:1-6.
3. Michie S, Hyder N, Walia A, West R. Development of a taxonomy of behaviour change techniques used in individual behavioural support for smoking cessation. *Addictive Behaviors*. 2011;36(4):315-318
4. Kong G, Ells DM, Camenga DR, Krishnan-Sarin S. Text messaging-based smoking cessation intervention: a narrative review. *Addict Behav*. 2014 May;39(5):907-17. doi: 0.1016/j.addbeh.2013.11.024. Epub 2013 Dec 4. Review. PubMed PMID: 24462528; PubMed Central PMCID: PMC3980005.