Smartphone apps for the prevention of smoking lapses to prevent relapse: A brief evidence review

Authors: Silja-Riin Voolma[1] and Felix Naughton, School of Health Sciences, [2] Medical School, UEA
March 2018

Of the three million smokers in the UK who try to quit every year, over 80% fail. Smokers often struggle to resist smoking triggers in their day-to-day environment. Any smoking, named a lapse, in the early stages of attempting to quit is highly predictive of subsequent relapse. Mobile phone technology could help those who want to quit smoking to be aware of and overcome environment-based smoking triggers. This is especially important for reducing the first lapse to smoking during a quit attempt.

We undertook a review of the current evidence to map the following:

- The availability and effectiveness of interventions to prevent smoking lapse.
- Effectiveness of smartphone apps in aiding smoking cessation
- Optimal study design to evaluate the effectiveness of smoking cessation interventions

WHAT DID WE FIND?

Lapse prevention interventions
- Research on lapse prevention interventions is fragmented and this type of intervention is often not identified as a distinct approach.
- The lapse prevention literature needs to be synthesised systematically to highlight the progress of the field and directions for future research.
- As smoking lapses compromise attempts to quit, lapse prevention interventions should be investigated as a standalone approach.

Smartphone apps to aid smoking cessation
- One randomised controlled trial of a smoking cessation app showed app users were 70% more likely to be abstinent from smoking at one-month follow up compared to a low intensity comparator app.
- Three other smaller randomised controlled trials of cessation smartphone apps were identified, none of which demonstrated effectiveness, although they show some promise.
- There is a great need for evaluations of smoking cessation apps given the large number available and downloaded from app stores that are not supported by evidence.

Optimal study design for evaluating smoking cessation interventions
- Randomised controlled trials still appear to be the optimal study designs for evaluating digital intervention effectiveness.

INTRODUCTION

Tobacco smoking is the largest single contributor to the UK disease burden and costs the NHS £5 billion annually. Changing smoking behaviour is highly challenging. Three million UK smokers attempt to quit smoking each year, but over 80% fail. A lapse (any smoking) in the early stages of attempting to quit is highly predictive of subsequent relapse (Deiches et al., 2013; Kenford et al., 1994; Shadel et al., 2011). Preventing early lapse should be a key goal for smoking cessation interventions, but this requires interventions to respond to environmental smoking triggers which the smoker encounters throughout the day. To find out what already exists to support smokers early in their quit process, we reviewed the evidence base of studies evaluating smoking cessation interventions, evaluated existing smartphone-based interventions and looked into the best research methods to test such interventions. This report outlines our findings.

Review of evidence of existing lapse prevention interventions

We reviewed the evidence on interventions that focus on the earliest stage of the quitting process and found the following:

- The terms lapse and relapse are often used interchangeably, each with varying definitions. This makes it challenging to assess the effect of some interventions.
- Interventions targeting lapse and relapse are not distinguished as separate entities and are often combined (Curry & McBride, 1994).
- Given evidence that a lapse to smoking in the early part of a quit attempt is highly predictive of a failure to quit, lapse prevention interventions should be investigated as a standalone method of promoting smoking cessation.

Review of existing smartphone smoking cessation apps

We reviewed the evidence on interventions that focus on the effectiveness of existing smartphone interventions and found the following:

- Smartphone-based smoking cessation apps have widespread user appeal, with over 400 such apps available on the Google Play and iTunes online stores (Heffner et al., 2015).
- Only 2 of the 50 most downloaded cessation apps are informed by primary research and none have rigorous evidence for effectiveness (Haskings et al., 2017).
- Making a quit plan, tracking and sharing of progress appear to be the most actively used smartphone smoking cessation intervention features (Heffner et al., 2015).
- Making a quit plan and facilitating a tracking practice of letting smoking urges pass are the only two app features which have been shown to be prospectively associated with quitting (Heffner et al., 2015).

- We found that only four smoking cessation smartphone apps have reached the evaluation stage (Buller et al., 2014; Bricker et al., 2014; Hassandra et al., 2017, BinDhim et al., 2018).
- Of these, three evaluations have been inconclusive, although one showed a non-statistically significant trend towards higher abstinence in its users than the control group (Bricker et al., 2014).
- The fourth evaluation (BinDhim et al., 2018) showed effectiveness of a smartphone smoking cessation app in increasing abstinence from smoking in daily smokers from the UK, Australia, Singapore and the US, compared to a low intensity comparator cessation app.
- An existing smoking cessation app, Smoke Free successfully engages 1 million new users every year and has shown some evidence that certain features within the app can increase abstinence from smoking (publication under review)
- Smoke Free is an independently developed app, outside of the NHS, but its development has been informed by theory and evidence-based approaches for supporting smoking cessation (https://smokefreeapp.com/).
- There is a pressing need for further investigation into the effectiveness of such interventions.

Approaches to evaluating digital behaviour change interventions

We investigated different study designs to identify the most optimal for evaluating a developed digital behaviour change intervention.

- After a thorough review of eleven evaluation designs, we find the randomised controlled trial (RCT) design to be the most optimal approach to evaluate digital behaviour change interventions, including smoking cessation interventions.
- While some evaluation designs provide a method for identifying promising intervention components e.g. the Multiphase Optimisation Strategy (MOST), almost invariably these end in a randomised controlled trial of some sort.

Conclusion

Interventions to help smokers in the earliest stages of their quit attempt are still in their infancy. Few interventions distinguish between the early stages of the process (e.g. up to 6 weeks) from the later ones, even though smoking in the early stages are potentially more serious for later relapse risk. Smartphone based interventions have high potential for supporting smokers early in the quit process, but not many have reached the evaluation stage. There is a pressing need for further investigation into the effectiveness of smartphone-based smoking cessation interventions and those providing support in the early stages of the quit process. This aligns closely with Public Health England's Digital strategy.

Recommendations

Of existing smoking cessation smartphone apps, the Smoke Free app has shown promise of effectiveness and a version of it is freely available on Android and Apple app stores.

REFERENCES

BinDhim, N.F., McGeechan, K. & Trevena, L. (2018). Smartphone Smoking Cessation Application (SCC App) trial: a multicountry double-blind automated randomised controlled trial of a smoking cessatino decision-aid 'app'. *BMJ Open*, 8(1), e017105.

Bricker, J.B., Mull, K.E., Kientz, J.A., Vilardaga, R., Mercer, L.D., Akioka, K.J. & Heffner, J.L. (2014). Randomized, controlled pilot trial of a smartphone app for smoking cessation using acceptance and commitment therapy. *Drug and Alcohol Dependence,* 143, 87-94.

Buller, D.B., Borland, R., Bettinghaus, E.P., Shane, J.H. & Zimmerman, D.E. (2014). Randomized trial of a smartphone mobile application compared to text messaging to support smoking cessation. *Telemedicine Journal and E-Health,* 20(3), 206-214.

Curry, S.J. & McBride, C.M. (1994). Relapse prevention for smoking cessation: review and evaluation of concepts and interventions. *Annual Review of Public Health,* 15, 345-366.

Deiches, J.F., Baker, T.B., Lanza, S., et al. (2013). Early lapses in a cessation attempt: lapse contexts, cessation success, and predictors of early lapse. *Nicotine & Tobacco Research*, 15(11), 1883-91.

Haskins, B.L., Lesperance, D., Gibbons, P. & Boudreaux, E.D. (2017). A systematic review of smartphone applications for smoking cessation. *Translational Behavioural Medicine, 7,* 292-299.

Hassandra, M., Lintunen, T., Hagger, M.S., Heikkinen, R., Vanhala, M. & Kettunen, T. (2017). An mHealth App for Supporting Quitters to Manage Cigarette Cravings With Short Bouts of Physical Activity: A Randomized Pilot Feasibility and Acceptability Study. *JMIR, 5*(5).

Heffner, J.L., Vilardaga, R., Mercer, L.D., Kientz, J.A. & Bricker, J.B. (2015). Feature-level analysis of a novel smartphone application for smoking cessation. *American Journal of Drug and Alcohol Abuse, 41*(1).

Kenford, S.L., Fiore, M.C., Jorenby, D.E., et al. (1994). Predicting smoking cessation. Who will quit with and without the nicotine patch. *JAMA*, 271(8), 589-94.

Shadel, W.G., Martino, S.C., Setodji, C., et al. (2011). Lapse-Induced Surges in Craving Influence Relapse in Adult Smokers: An Experimental Investigation. *Health Psychology*, 30(5), 588-96.