

SSA Griffith Edwards Academic Fellowship Final Report

Name: Felix Naughton

Title: Dr

Year: November 2016 (Fellowship ended prematurely, completing two of three planned years)

Summary

Below are achievement highlights during the two-year fellowship:

- I've been an applicant in 10 successful grant applications totalling more than £7 million focused primarily on smoking cessation interventions, as a result of established and new collaborations
 - I have published 15 papers, including 10 as first or last author
 - I have presented 16 papers at national and international conferences, including 3 invited plenary talks, on fellowship-related research
 - I have secured a tenured, research-focused Senior Lectureship in Health Psychology at the School of Health Sciences, University of East Anglia, to continue developing a research programme into digital interventions for smoking cessation and health behaviour change
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The focus of the fellowship was to explore the potential of using mobile phone technologies to address key gaps in smoking cessation support provision. There were three main workstreams:

Workstream 1. Refinement of a novel smoking cessation smartphone sensing app (Q Sense)

- a. Assess the feasibility and acceptability of Q Sense
- b. Explore the micro-environmental triggers of smoking
- c. Undertake refinement work informed by a. and b.

Workstream 2. Assessing the real-world uptake and mechanism of action of a tailored text message smoking cessation intervention for pregnant smokers (MiQuit)

- a. Compare the estimated uptake rates across four real-world settings
- b. Explore differences in usage, interaction and discontinuation with MiQuit within and between the different settings
- c. Explore the mechanism of action of MiQuit using trial data

Workstream 3. Development of a tailored text message Nicotine Replacement Therapy (NRT) adherence intervention for pregnant smokers

- a. Undertake a systematic review of NRT adherence interventions
- b. Identify key barriers and facilitators to using NRT in pregnancy and preferences for adherence support
- c. Design a prototype tailored text message NRT adherence intervention

Any comments on adjustments or alterations to intended work-plan/timetable

Workstream 1

a. The Q Sense app feasibility study was completed in January 2015 and analysis was undertaken between January and September, extended because of additional analyses exploring app interaction undertaken with computer science collaborators. The write up of the mixed methods paper was undertaken between May 2015 and December 2016 and the paper was accepted for publication in May 2016. Recruitment for the acceptability study started in April but took longer than anticipated, and the study was extended from an original end date of September 2015 to March 2016 (agreed with the MRC). The acceptability study data was collected by March 2016, and was analysed between April and July 2016. The write up is in progress at the time of writing this report.

b. While originally the intention was to explore micro-environmental triggers of smoking, a more field-relevant opportunity arose, looking at the response time to engaging with real time smoking cessation messages delivered by the app. This has been presented at several conferences and has attracted much interest as it is novel and relevant to a new type of digital intervention referred to as 'Just-In-Time Adaptive Interventions' (JITAs). The plan is to write this up for publication either as a separate paper or combine this with the ongoing write up of the acceptability study. In addition to this, I obtained additional funding through the NIHR School for Primary Care to extend the scope of the acceptability study by exploring the potential of a data communication module within Q Sense to connect smokers with stop smoking service advisors and enable advisors to view data collected by the app. This includes asking additional questions of smokers being interviewed as part of the acceptability study about their views on a communication module and interviewing advisors to gain their views in addition.

c. Key refinement work is currently being undertaken collaboratively between myself, Prof. Cecilia Mascolo and a postdoc computer scientist. This includes enabling the message delivery system in Q Sense to be native to the app i.e. avoid the need for an internet connection for message delivery. This is in response to the findings of the feasibility and acceptability studies and represents a substantial 'upgrade.' I have attempted to gain funding from Cancer Research UK to undertake app optimisation work (increasing the number of sensors used and integrating machine learning to personalise the types of support messages delivered) and evaluate the app in an explanatory randomised controlled trial. However, this was unsuccessful. I am currently putting together a Research Capability Funding (RCF) application to fund development work for a NIHR Public Health Research scheme application to undertake this refinement work and undertake an explanatory randomised controlled trial.

Workstream 2

a. & b. The uptake of the text messaging intervention for pregnant smokers (MiQuit) when advertised online, representing one of the four real-world settings where uptake is being evaluated, was completed earlier than originally planned (completed October 2015). The other uptake studies were completed as planned. Analysis of uptake study data to address aims a. and b. have been completed and in addition to other papers, a paper focused primarily on the online uptake, which includes comparative data from other uptake studies

and the MiQuit trial, has been drafted (in collaboration with a Research Associate I supervise) and is due to be submitted to *Implementation Science*.

c. The MiQuit trial was completed in May 2015 and the main outcomes have been analysed by the trial team (led by the Research Associate I supervise) and I have written this up for publication. It is currently under review at *Addiction*. After the trial outcomes paper has been published, I plan to undertake the analyses exploring mechanism of action of MiQuit.

Workstream 3

a. The systematic review was pushed back top year 3 due to overrunning of workstream 1 a. and due to funding applications having been put together and submitted. As the fellowship has ended prematurely, this will now be undertaken as part of a successful NIHR programme grant (PI: Prof. Tim Coleman).

b. I was involved in an analysis of qualitative data, led by a PhD student in Nottingham, to identify barriers and facilitators to using NRT in pregnancy, which was published in *Nicotine and Tobacco Research* (Bowker et al). I am about to start reviewing qualitative data from this study to explore preferences for adherence support as originally planned.

c. I designed a logic model for a tailored digital Nicotine Replacement Therapy (NRT) adherence intervention as part of the NIHR programme grant mentioned above (developing and evaluating a NRT intervention for pregnant smokers led by Prof. Tim Coleman) (see Appendix 1). This includes digital and face-to-face components. This work will continue as part of the NIHR programme grant. I am leading the two workstreams focused on development and pilot testing the intervention.

Grant applications and publications

Originally I had envisaged involvement in/leading the development and submission of grant applications connected to fellowship projects near the end of the fellowship. However, I have been involved in this earlier than anticipated and have been involved in over 10 grant application submissions (see funding applications section) in the two years of the fellowship. In addition, I have led or been the co-author on a number of studies both within and outside of the core focus of the fellowship that have been published during the course of the fellowship. These are all in areas that are highly relevant to the fellowship topic of study – nicotine and tobacco addiction.

Funding applications

Unsuccessful

T. Coleman, J. Leonardi-Bee, **F. Naughton**, S. Sutton, M. Ussher, D. Torgerson, C. Hewitt, J. Watson, S. Cooper, S. Parrott, K. Foster, M. Jones. The MiQuit study: Randomised controlled trial testing effectiveness and cost effectiveness of a tailored text message programme for smoking cessation in pregnancy. NIHR Health Technology Assessment Programme: April 2016 – December 2019, £1,583,924 (stage 2 submitted)

F. Naughton (joint PI), S. Sutton (joint PI), A. McEwen, A. Prevost, C. Mascolo, T. Coleman. Optimisation and efficacy evaluation of a novel smartphone app for smoking cessation that delivers ‘context aware’ lapse prevention support in real time. Cancer Research UK

Population Research Committee Project Award: October 2016 – September 2019, £317,644 (full application submitted)

C. Mascolo (PI), A. Beresford, **F. Naughton**, PJ Rentfrow, S. Sutton, Y. Rogers, J. Shawe-Taylor. W-HEALTH Wearable and Mobile Technology for Behaviour Intervention and Health Monitoring. Engineering and Physical Sciences Council Programme Grant: October 2016 – September 2021, £3,200,000 (stage 1 submitted)

A. Sutherland (joint PI), **F. Naughton** (joint PI), E. Pitchforth, A. Martin. Tobacco Control Measures: Trends and Impacts. NIHR Policy Research Programme: May 2016 – April 2019, £479,278 (stage 2 submitted)

S. Sutton (PI), **F. Naughton**, C. Mascolo, A. McEwen, T. Coleman. Behaviour and situation: using smartphone sensing to understand and change health behaviour. Wellcome Trust Collaborative Award. £999,039

Pending

L. Bauld (PI), S. Ferguson, H. McRobbie, F. Naughton, J. Brown, F. Dobbie, I. Bindoff, G. Peterson, B. Schuez, S. Parrott, A. Brennan, R. Courtney, S. Bascomb, J. Thrul, L. Blizzard. Quittr: Using social media and serious gaming to promote smoking cessation in young people in the UK and Australia. NIHR Health Technology Assessment Programme: October 2017 – September 2021, £1,271,773 (stage 1 submitted)

E. Fulton (PI), B. Grunfield, K. Brown, K. Kwah, F. Naughton, A. Khan, D. Baines, I. Tombor. A randomised controlled trial to assess the effectiveness and cost effectiveness of a tailored digital behaviour change intervention with e-referral system to increase uptake and attendance at NHS Stop Smoking Services: The StopApp. NIHR Public Health Research Programme: January 2017 – June 2019, £498,400 (full application submitted)

Awarded

C. Notley (PI), R. Holland, V. Maskrey, M. Ussher, F. Naughton, L. Bauld, S. Orton, W. Hardeman. Preventing Return to Smoking Postpartum (PReS Study) – Development of a complex intervention to sustain smoking cessation in postpartum women. MRC Public Health Intervention Development (PHIND) scheme. January 2017 - June 2018, £146,189

S. Sutton (PI), J. Mant, S. Griffin, W. Hardeman, F. Naughton, A. De Simoni, H. Eborall, T. Prevost, E. Wilson, D. Bhattacharya, C. Mascolo. Scalable low-cost interventions to support medication adherence in people prescribed treatment for hypertension in primary care. NIHR Programme Grants for Applied Research: February 2017 – January 2022, £1,996,966

T. Coleman (PI), S. Mountcastle, S. Cooper, S. Parrott, M. Ussher, S. Lewis, F. Naughton, I. Berlin, L. Bauld, D. Torgerson, S. Sutton, L. Szatkowski, A. McEwen, J. Greenwood, P. Aveyard. Improving effectiveness of nicotine replacement therapy for smoking cessation in pregnancy through better adherence and adequate dosing. NIHR Programme Grants for Applied Research: April 2017 – March 2023, £2,460,155

P. Hajek (PI), T. Coleman, M. Ussher, L. Bauld, H. McRobbie, S. Cooper, F. Naughton, L. Sinclair, S. Lewis. Helping pregnant smokers quit: Role of electronic cigarettes
Effectiveness trial of E-cigarettes among pregnant smokers. NIHR Health Technology Assessment Programme: January 2016 – June 2019, £1,420,000

R. Begh (PI), P. Aveyard, T. Coleman, F. Naughton, H. Gilbert, R. Barnes. A randomised controlled trial on the effectiveness of GP promotion of e-cigarettes in supporting reduced smoking and abstinence in hardcore smokers with smoking-related chronic disease. National Institute for Health Research (NIHR) School for Primary Care Research Project Research Grant: October 2016 - September 2018, £361,597

F. Naughton (PI), S. Sutton, T. Coleman, A. Prevost, F. Lorencatto. Smoking cessation advice in primary care; what does it comprise of and does it make a difference? Cancer Research UK Tobacco Advisory Group project grant: November 2016 – October 2017, £38,896

F. Naughton (PI), S. Sutton, T. Coleman. Assessing the potential of a data sharing and communication facility within a cessation smartphone app (Q Sense) for patients and NHS smoking cessation advisors. National Institute for Health Research (NIHR) School for Primary Care Research Project Research Grant: September 2015 - March 2016, £23,554

S. Sutton (PI), F. Naughton, E. Wilson, A. McEwen, A.T. Prevost, T. Coleman. Improving quit rates among smokers in primary care: Pragmatic trial of effectiveness and cost-effectiveness of a tailored web- and text message-based intervention for smoking cessation. Cancer Research UK Research Grant: January 2016 - December 2019, £411,970

M. Ussher (PI), T. Coleman, S. Lewis, L. Sinclair, S. Cooper, F. Naughton, K. Bowker, L. Bauld. Attitudes to electronic cigarettes: a qualitative study of women who are pregnant or have recently given birth. Cancer Research UK Tobacco Advisory Group (TAG) Project Grant: September 2015 - August 2016, £46,263

T. Coleman (PI), P. Wray, H. Cripps, S. Diggle, S. Cooper, K. Watts, S. Lewis, S. Sutton, F. Naughton, M. Ussher, L. Bauld, D. Tappin, I. Berlin. Enhancing use of nicotine replacement therapy for stopping smoking in pregnancy and minimising relapse to smoking afterwards. Nottingham City Clinical Commissioning Group (CCG) NIHR Programme Grant for Applied Research (PGfAR) Development Funding award: April 2015 - March 2017, £40,000

Collaborations

See funding applications for key collaborations. A new collaboration of significance is with Dr Caitlin Notley (a current SSA Fellow) who I am collaborating with on a successful MRC Public Health Intervention Development (PHIND) Scheme application.

Mentoring

I have had quarterly meetings with my supervisor/mentor (Prof. Tim Coleman), though the meeting scheduled for July 2016 had to be cancelled due to personal leave. These supervisions have provided an opportunity to discuss fellowship and work progress, to discuss any arising issues or aspects of my work where input was required and set/adjust

plans for future work. From my perspective, the mentor relationship has been very positive, both relating to fellowship specific research and more general career support and guidance.

Supervision

During the fellowship I have supervised two research assistants, one research associate (postdoc) and co-supervised three PhD students, although one transferred to another institution at the end of his first year.

Publications

Conference presentations

Naughton F. The role of mobile sensing in behaviour change – Q Sense; a context aware smoking cessation app. Invited talk at the PRECIOUS workshop, London, 2016.

Naughton F, Hopewell S, Lathia N, Brown C, Mascolo C, McEwen A, Sutton S. The acceptability of and real time engagement with a context-aware smartphone smoking cessation app (Q Sense). Oral presentation at the Society for Research on Nicotine and Tobacco, Prague, Czech Republic, 2016.

Naughton F, Foster K, Emery J, Cooper S, Sutton S, Leonardi-Bee J, Jones M, Ussher M, Whitemore R, Leighton M, Montgomery A, Parrott S, Coleman T. Multicentre, randomised controlled trial of a smoking cessation text message intervention for pregnant smokers (MiQuit). Oral presentation at the Joint European Health Psychology Society and Division of Health Psychology conference, Aberdeen, 2016.

Naughton F. Pimp your app – incorporating context awareness into a smoking cessation app. Invited plenary talk at the National University of Ireland mHealth conference, Galway, Ireland, 2016.

Naughton F, Hopewell S, Sutton S. The acceptability of a context-aware smartphone smoking cessation app (Q Sense). Oral presentation at the UK Nicotine and Smoking Cessation Conference, London 2016.

Naughton F. Apps to drive behaviour change. Invited plenary talk at the Royal Society of Medicine conference ‘medical apps: mainstreaming innovation’, London, 2016.

Naughton F, Brown C, Lathia N, Hopewell S, Sutton S & Mascolo C. Speed of engagement with support generated by a smoking cessation smartphone Just In Time Adaptive Intervention (JITAI). Oral presentation at the UCL Centre for Behaviour Change Harnessing Digital Technology for Health Behaviour Change conference, London, 2016.

Naughton F. User engagement and experience of a context aware smartphone sensing app for smoking cessation (Q Sense). Invited talk, Tobacco and Alcohol Research Group seminar, Experimental Psychology, University of Bristol, 2016.

Naughton F, Vanderbloemen L, Orton S, Bowker K, Coleman T, Leonardi-Bee J, Cooper S, Sutton S, Ussher M. Interest in and use of smoking cessation support

across pregnancy and after delivery. Oral presentation at the UK Society for Behavioural Medicine annual conference, Newcastle, 2015.

Naughton F. Q Sense: a context aware smartphone sensing app for smoking cessation. Invited oral presentation at the Society for the Study of Addiction Annual Conference, York, 2015.

Naughton F, Sinclair L, Ford A, McKell J, Hopewell S, Bauld L. A qualitative investigation into the barriers and facilitators to smoking cessation during pregnancy from three perspectives - pregnant women, their partners and healthcare professionals. Oral presentation at the UK Society for Behavioural Medicine annual conference, Newcastle, 2015.

Naughton F, Vanderbloemen L, Orton S, Bowker K, Coleman T, Leonardi-Bee J, Cooper S, Sutton S, Ussher M. Interest in and use of smoking cessation support across pregnancy and after delivery. Oral presentation at the Division of Health Psychology Conference, London, UK, 2015

Naughton F, Hopewell S, Lathia N, Schalbroeck R, Mascolo C, McEwen A, Sutton S. The feasibility of a context aware smoking cessation app (Q Sense): a mixed methods study. Oral presentation at the European Health Psychology Society Conference, Limasol, Cyprus, 2015

Naughton F. Invited talk ("Research needs") at the Pregnancy Challenge Group organised by Action on Smoking and Health (ASH), London, UK, 2015

Naughton F. Invited plenary presentation ("Using smartphone sensing and machine learning to translate theory and evidence into intervention content") at the University College London Centre for Behaviour Change conference, London, UK, 2015

Naughton F, Lathia N, Hopewell S, Brafman-Price B, Mascolo C, McEwen A and Sutton S. The development of a novel sensing smoking cessation app (Q Sense). Oral presentation (symposium) at the UK Society for Behavioural Medicine Conference, Nottingham, UK, 2014.

Published papers

Campbell K, Bowker K, Sloan M, **Naughton F**, Cooper S, Coleman T. A qualitative evaluation of antenatal staff's views and attitudes towards an 'opt-out' referral pathway for pregnant women to NHS stop smoking services. *International Journal of Environmental Research and Public Health* (in press).

Sloan M, Hopewell S, Coleman T, Cooper S, **Naughton F**. Smoking cessation support by text message during pregnancy: a qualitative study of views and experiences of the MiQuit intervention. *Nicotine & Tobacco Research* (in press)

Emery J, Sutton S, **Naughton F**. Cognitive and behavioural predictors of quit attempts and biochemically-validated abstinence during pregnancy. *Nicotine & Tobacco Research (in press)*

Yardley L, Spring BJ, Riper H, Morrison LG, Crane DH, Curtis K, Merchant GC, **Naughton F**, Blandford AE. Understanding and Promoting Engagement with Digital Behavior Change Interventions. *American Journal of Preventive Medicine (in press)*

Naughton F, Hopewell S, Lathia N, Schalbroeck R, Brown C, Mascolo C, Sutton S. The feasibility of a context sensing smoking cessation smartphone application (Q Sense): a mixed methods study. *JMIR mHealth uHealth (in press)*

Naughton F. Delivering 'Just-In-Time' smoking cessation support via mobile phones: Current knowledge and future directions. *Nicotine & Tobacco Research (in press)*

Riaz M, Lewis S, Coleman T, Aveyard P, West R, **Naughton F**, Ussher M. Which measures of cigarette dependence are the strongest predictors of smoking cessation during pregnancy? Analysis of data from a randomised controlled trial. *Addiction (in press)*

Naughton F, Riaz M, Sutton S. Response Parameters for SMS Text Message Assessments Among Pregnant and General Smokers Participating in SMS Cessation Trials. *Nicotine & Tobacco Research*, 2016, 18(5):1210-4

Sloan M, Campbell K, Bowker K, Coleman T, Cooper S, Brafman-Price B, **Naughton F**. Pregnant women's experiences and views on an 'opt-out' referral pathway to specialist smoking cessation support: a qualitative evaluation. *Nicotine & Tobacco Research*, 2016, 18(5):900-5

Bowker K, Campbell K, Coleman T, Lewis S, **Naughton F**, Cooper S. Understanding pregnant smokers' adherence to nicotine replacement therapy during a quit attempt: a qualitative study. *Nicotine & Tobacco Research*, 2016, 18(5):906-12

Naughton F. Daily e-cigarette use increases quit attempts and reduces smoking with no effect on cessation. *Evidence based Nursing*, 2016, 19(1):18

Naughton F, Cooper S, Bowker K, Sutton S, Leonardi-Bee J, Sloan M, Campbell K, Fahy S, Coleman T. The adaption and uptake of a text message smoking cessation programme (MiQuit) for use in early antenatal care. *BMJ Open*, 2015, 5:e008871

Faulkner K, Sutton S, Jamison J, Sloan M, Boase S, **Naughton F**. Are nurses and auxiliary healthcare workers equally effective in delivering smoking cessation support in primary care? *Nicotine & Tobacco Research*, 2016, 18(5):1054-60

Cooper S, Foster, K, **Naughton F**, Leonardi-Bee J, Sutton S, Ussher M, Leighton M, Montgomery A, Parrott S, Coleman T. Pilot study to evaluate a tailored text message

intervention for pregnant smokers (MiQuit): study protocol for a randomised controlled trial. *Trials*, 2015, 16:29

Naughton F, McEwen A, Sutton S. Use and effectiveness of lapse prevention strategies among pregnant smokers. *Journal of Health Psychology*, 2015, 20(11): 1427-1433

Naughton F and Johnston D. A starter kit for undertaking n-of-1 trials. *The European Health Psychologist*, 2014, 16(5): 196-205

Submitted papers

Naughton F, Foster K, Emery J, Cooper S, Sutton S, Leonardi-Bee J, Jones M, Ussher M, Whitemore R, Leighton M, Montgomery A, Parrott S, Coleman T. Multicentre, randomised controlled trial of a smoking cessation text message intervention for pregnant smokers (MiQuit). Submitted to *Addiction* (under review)

Riaz M, Lewis S, **Naughton F**, Ussher M. Predictors of smoking cessation during pregnancy: a systematic review. Submitted to *Addiction* (under review)