Institution: University of Aberdeen

Unit of Assessment: UoA4: Psychology, Psychiatry and Neuroscience

Title of case study: A new blueprint for behaviour change interventions to improve public health and safety

Period when the underpinning research was undertaken: 2010-2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Marie Johnston	Professor of Health Psychology	Aug 2003 - Dec 2010
	Emeritus Professor	2011 - present
Jill Francis	Professor of Health Psychology	2004 - Dec 2012

Period when the claimed impact occurred: 2013 and onwards

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact (indicative maximum 100 words)

Behavioural change for health (e.g., smoking, alcohol use) or safety (e.g., driving) saves countless lives. Research conducted at the University of Aberdeen, in collaboration with University College London, has transformed the way in which behavioural change interventions are developed, reported, and interpreted. The research has created a standardised, shared taxonomy to describe complex interventions used to tackle behaviour change, providing a practical approach to plan, facilitate and evaluate behavioural change interventions to improve public health and safety. From this, the research team has developed a range of new training resources, which are now used widely to help healthcare practitioners, both in the UK and overseas, to understand and implement the new standard, and to increase the effectiveness of their practice. The research has also underpinned behaviour change in food and transport safety.

2. Underpinning research (indicative maximum 500 words)

Behavioural change interventions can undo the harms from smoking, poor diet, alcohol and drug use, which account for approximately one third of global disability and mortality. Other challenges for public health and public safety – such as antimicrobial resistance, mental health problems, the transmission of infectious diseases, and food, water and transport safety – also depend on behavioural change. It is imperative for health improvement that effective and consistent methods of changing behaviour are developed and implemented. Before the research carried out by the University of Aberdeen and University College London (UCL), there was a vast and growing literature of behaviour change interventions but no standardised scientific language for defining and reporting their components. This meant that evidence from different behavioural trials could not be reliably interpreted, synthesised, or effectively implemented. To address this gap, researchers at Aberdeen (Prof Marie Johnston and Prof Jillian Francis) and UCL (Prof Susan Michie) developed a new taxonomy to universally describe the component blocks of behaviour change interventions, creating a novel shared language. The conceptual work, intellectual leadership and reporting was shared equally between Aberdeen and UCL; the project was managed, and research staff supervised, by UCL; and Aberdeen led on the quantitative work, with Aberdeen contributing to 40% of the project, spanning Sept 2010 - Aug 2013 [**P1**, **S1**].

The first phase of the research brought together 400 behaviour change experts from 12 countries (from Europe, North America and Australia) who were actively engaged in behaviour change interventions. These stakeholders included systematic reviewers, researchers, practitioners and policy makers with roles in investigating, designing and/or delivering healthcare interventions. Researchers worked with these experts in 'Delphi' procedures, where expert panels undergo repeated consultation to arrive at a group consensus, involving training workshops; coding

exercises; development of labels and definitions; hierarchy development (inductive 'bottom-up' and theory-driven 'top-down' open-sort procedures); reliability testing; and consultation with an international interdisciplinary advisory board. This identified **93 non-overlapping *behaviour change techniques* (BCTs)** – the 'active ingredients' of a behaviour change intervention – each of which was labelled and defined before being organised into a hierarchical taxonomy, consisting of 16 empirically derived groups. This completely novel development is known as the **BCT Taxonomy v1 (BCTTv1)** [**R1, R2**].

To evaluate the taxonomy and develop a training programme, the researchers conducted a study to assess two programmes for new user training in BCTTv1. The study involved 109 BCT trainees (practitioners, students and researchers) in workshops; and 52 taking a series of online tutorials. The findings showed that the two methods were equally effective in training BCT coding [**R3**]. The team then carried out further evaluation in a series of studies involving 40 researchers (in evidence synthesis and intervention development) trained in using BCTTv1. The studies involved providing trained experts with a coding manual and inviting them to code published descriptions of complex interventions, enabling the team to assess the reliability between experts, over time and across types of user. The evaluation demonstrated that the taxonomy could be used reliably to code the active behaviour change ingredients of 40 different published interventions, thereby proving its functionality [**R4**].

These research studies were collectively presented in a Health Technology Assessment report for the NIHR, setting out in full the rigorous development, evaluation, and implementation of BCTTv1 [**R5**] and have been further validated by over 400 publications worldwide demonstrating that using the coded BCTs helped to predict outcomes of behavioural change trials. A shared descriptive language to make sense of behaviour change intervention studies facilitates effective intervention design, translating knowledge into improved public health. Over 3,400 publications have cited the taxonomy indicating its recognition in the behavioural science field.

To enable frontline healthcare staff to use the taxonomy in practice, the team then developed a mnemonic to map BCTs to three routes to behaviour change, using quantitative judgement methods. Based on current theories and their findings to date, the researchers proposed that practitioners achieve behaviour change by one of three processes: Motivation, Action control or Prompts – resulting in the 'MAP' of 3 routes to behaviour change. Using a quantitative method (Discriminant Content Validation) involving 14 behaviour change experts, the researchers found that 28 BCTs were appropriate for practitioners to use to enhance motivation, 21 to increase Action control and 9 to enable the use of Prompts [**R6**].

This research means that, for the first time, there is a shared scientific language provided by BCTTv1 that meaningfully describes active behavioural intervention components, deriving a better understanding from such studies and allowing the theories of behavioural science to be implemented in practice for those working to improve health or safety.

3. References to the research (indicative maximum of six references)

The quality of the research is deemed to be at least of 2* quality as corroborated by the following peer-reviewed, international publications (with Google Scholar **citations**) and highly competitive grant awarded by Medical Research Council:

R1. Michie, S., Richardson, **M., Johnston**, M., Abraham, C., **Francis, J**., Hardeman, W., Eccles, M., Cane, J. and Wood, C. (2013). The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions. *Annals of Behavioral Medicine*, [online] 46(1), pp.81-95. https://doi.org/10.1007/s12160-013-9486-6
[most cited article ever for this journal which is a leader in the field] (**3504**)

R2. Cane, J., Richardson, **M., Johnston**, M., Ladha, R. and Michie, S. (2014). From lists of behaviour change techniques (BCTs) to structured hierarchies: Comparison of two methods of

developing a hierarchy of BCTs. *British Journal of Health Psychology*, [online] 20(1), pp.130-150. https://doi.org/10.1111/bjhp.12102 (**210**)

R3. Wood, C., Richardson, M., **Johnston, M.,** Abraham, C., **Francis, J**., Hardeman, W. and Michie, S. (2014). Applying the behaviour change technique (BCT) taxonomy v1: a study of coder training. *Translational Behavioral Medicine*, [online] 5(2), pp.134-148. https://doi.org/10.1007/s13142-014-0290-z (**68**)

R4. Abraham, C., Wood, C., **Johnston, M.**, **Francis, J**., Hardeman, W., Richardson, M. and Michie, S. (2015). Reliability of Identification of Behavior Change Techniques in Intervention Descriptions. *Annals of Behavioral Medicine*, [online] 49(6), pp.885-900. https://doi.org/10.1007/s12160-015-9727-y (**53**)

R5. Michie, S., Wood, C., **Johnston, M.**, Abraham, C., **Francis, J**. and Hardeman, W. (2015). Behaviour change techniques: the development and evaluation of a taxonomic method for reporting and describing behaviour change interventions (a **suite of five** studies involving consensus methods, randomised controlled trials and analysis of qualitative data). *Health Technology Assessment*, 19(99), pp.1-188. https://doi.org/10.3310/hta19990 (**287**)

R6. Dixon D, **Johnston M**. MAP: A mnemonic for mapping BCTs to three routes to behaviour change (2020). *British Journal of Health Psychology, 25*,1086-1101; doi:10.1111/bjhp.12458 (**2**)

Funding:

P1. Methods for strengthening evaluation and implementation: specifying components of behaviour change interventions G0901474, Funded Value: GBP526,049 (Abdn portion GBP23,833); Sep 2010 - Aug 2013; Medical Research Council; Susan Fiona Michie (Principal Investigator); Samuel Charles Abraham, Wendy Hardeman, Marie Johnston, Jillian Joy Francis, Martin Paul Eccles

4. Details of the impact (indicative maximum 750 words)

The development of a standardised, shared classification system to describe the complex interventions used to tackle behaviour change is key to translating scientific knowledge into improved public health. The research by Aberdeen and UCL has transformed the field of behavioural science by creating a new and shared standard to report behavioural change techniques, which has been widely implemented resulting in more effective practice. The team has developed new training resources to help healthcare practitioners – both in the UK and overseas – to understand and use the new standard. The research has also influenced techniques for behavioural change beyond healthcare, specifically underpinning developments in food and transport safety.

The blueprint for 'gold standard' design and reporting of behavioural change interventions

The creation of the BCTTv1 by UCL and University of Aberdeen [**S1**] represented the first-of-its-kind taxonomy to universally describe the component blocks of behaviour change interventions, enabling more effective identification and reporting of behavioural change techniques via a common language. The value of the taxonomy is reflected in its adoption by NICE in January 2014 as an example of how to provide a clear definition of the behaviour change techniques used so that each component can be replicated, ensuring consistency of approach to behaviour change interventions within public health guidelines [**S2**].

Changing professional training for healthcare providers

BCTTv1 has impacted the training and practice of healthcare professionals who implement behavioural change interventions, both in the UK and overseas. Workshops training UK healthcare professionals, policy makers, and others from both the public and private sectors in behavioural change interventions use the taxonomy as standard, including Public Health England and NICE, as well as a range of universities and CPD and other training providers. The researchers have created a MAP3 mnemonic [**R6**] and 'periodic table' presentation [**S3i**] of the taxonomy to develop

a suite of free online training resources. To date over 10,000 people have accessed the online training, which over six sessions introduces users to BCTTv1 to practice identifying BCTs in different intervention descriptions [**S3ii-iv**]. A smartphone app detailing each BCT and giving examples of how to implement these, launched in May 2014, to support professional training. Nearly 4,200 people have downloaded the app [**S3v-vi**].

The 2018 Public Health Strategy "*Improving people's health: Applying behavioural and social sciences to improve population health and wellbeing in England*" identifies the BCT Taxonomy and associated free online training resources as "*Key frameworks and tools for public health practitioners*" [**S4**]. The taxonomy has also been used by Manchester Implementation Science Collaboration at the University of Manchester to create 'Card for Change', which present BCTTv1 as a deck of cards which can be used to play games that teach the taxonomy in a mobile and accessible way for low- and middle-income countries. Since 2019, over 1,000 decks of cards have been distributed to researchers, practitioners, health workers and educators across 25 countries in five continents. The developers of the cards said: "*We continue to use the BCTTv1 taxonomy/Cards for Change to make an impact in continuing professional development for health workers both in the UK and in low- and middle-income countries by training health professionals in using behaviour change to both design education and training*" [**S5**; **S6i**].

Specific examples of where the taxonomy has been incorporated into professional training for healthcare providers include:

NHS Scotland: Behavioural change training by NHS Education for Scotland is based on the MAP mnemonic and BCTTv1 [**S7i**], chosen for "*more effective, pragmatic and evidence-based behavioural change training for NHS practitioners*" [**S7ii**]. This training is provided for all health and social care practitioners to enable behaviour change in the people for whom they care. Since 2015, over 2,500 NHS professionals have been trained using BCTTv1 across eleven of the fourteen Scottish health boards, including a wide range of health and social care professionals: clinicians working in primary and secondary care; dentists; pharmacists; and social care staff. More recently, BCTTv1 is the basis of a novel behaviour change training programme for Early Years staff, including nurses, nursery nurses, oral health practitioners, health visitors and midwives who work with young children, their parents and families. The programme is currently being piloted prior to national roll out across Scotland. Programme Lead for Health Psychology for NHS Education for Scotland said: "*The training using the taxonomy of behaviour change techniques has been robustly evaluated and shown a positive impact on practitioners' knowledge, engagement with behaviour change and implementation in practice*." [**S7ii**].

NHS England: A key priority in the UK and globally is to tackle the serious public health threat posed by antimicrobial resistance. The UK Government is running a 5-year (2019-2024) action plan to tackle this threat. Central to the strategy is the need to change risky behaviours by healthcare practitioners such as inappropriate antibiotic prescribing. The BCTTv1 taxonomy was at the heart of Health Education England training for healthcare practitioners on this need for behavioural change, which provided "*Practical training to apply behavioural science to antimicrobial stewardship*" (2019-2020), at which 38 people were trained, who have in turn trained up to 300 colleagues [**S6i-ii**].

The Change Exchange led by Manchester University used BCTTv1 to strengthen health partnerships in Africa by translating behavioural science in situ. In a case study from Uganda, BCTTv1 was used to review and code behaviour change therapies identified in the training of around 100 health professionals to further enhance interventions and assessment methods in obstetric care. The Global Health Unit administrator for the Royal College of Obstetrics and Gynaecology said: "*from our perspective it was like a piece of the puzzle that had been missing that we hadn't realised and … it is a really fundamental part to the work that we are trying to do*" [**S6i**; **S8i-ii**].

Underpinning changes in safety-related behaviours

BCTTv1 has underpinned behavioural change in areas beyond health, particularly in food and transport safety. Safefood Ireland, the public body for food safety and healthy eating in the

Republic of Ireland and Northern Ireland, used the BCTTv1 to underpin campaign strategy and design, as well as for training of communications and PR agencies producing those campaigns. Safefood Ireland has said of the taxonomy: "*it brings the security of applying best practice and a defensible way of working - based on all the research. We are practitioners….it is a ready-made tool that we can use with some security we are doing the right thing"* [**S9**; p9, Table 1; p12].
The 93 BCTs of BCTTv1 are central to a 2017 report commissioned by the RAC Foundation, "*Using Behaviour Change Techniques - Guidance for the Road Safety Community*" [**S10i**]. This report has been promoted by the charity, *Roadsafe*, and has influenced the development of behaviour change courses at the UK's national road safety organisation, Road Safety GB. [**S10ii-iii**]. BCTTv1 informed the *DriveStart* Programme, developed by road safety consulting organisation, Agilysis, to reduce risky decisions for novice young drivers and reduce the number of young lives that are lost due to motor vehicle accidents. *DriveStart* used BCTTv1 to code intervention content [**S11i-ii**]. Head of Research at the RAC Foundation has said "*the BCTTv1 taxonomy has been of significant benefit to improving road safety activity in the UK, as it provides both an evidence based and practical approach for deliverers to engage with*" [**S10ii**]. BCTTv1 was used in designing one of five interventions for *Driver2020*, a part of the UK government's *The Road Safety Statement 2019 – A Lifetime of Road Safety*, involving interventions in >14,000 young drivers to promote safety, confidence and skill in the first year of driving [**S11ii-iv**].

5. Sources to corroborate the impact (indicative maximum of 10 references)

S1. Testimonial letter - collaborator on BCTTv1 UCL

S2. NICE Public Health Guideline PH49, 'Behaviour change: individual approaches', published 2 January 2014. Recommendation 6. https://www.nice.org.uk/guidance/ph49

S3. (i) Periodic layout of BCTTv1; (ii) BCT online training; (iii) BCT starter pack; (iv) metrics on BCT online training uptake; (v) BCT App; (vi) metrics on App downloads

S4. Public Health England 2018 Strategy document: Improving people's health: Applying behavioural and social sciences to improve population health and wellbeing in England (p28-29)

S5. Cards for Change: https://www.mcrimpsci.org/change-exchange/cards-for-change/

S6. (i) Testimonial letter - creators of Cards for Change; Workforce Council member Psychological Professions Network, Health Education England; (ii) AMS training HEE

S7. (i) NHS Education Scotland MAP Programme; (ii) Testimonial letter - Programme Lead for Health Psychology, NHS Education for Scotland

S8. (i) Article: *How behavioural science can contribute to health partnerships: the case of The Change Exchange* https://doi.org/10.1186/s12992-017-0254-4; (ii) Uganda case study https://www.mcrimpsci.org/case-studies/emergency-obstetric-training-in-uganda/

S9. UCL Behaviour Change Techniques Taxonomy Business Case Report 2019

S10. (i) RAC 2017 Report: Using Behaviour Change Techniques: Guidance for the road safety community; (ii) Correspondence – Head of Research, RAC Foundation; (iii) Road Safety GB Academy – 2-day course on behavioural change models and techniques

S11. Young people driver programmes: (i) DriveStart information; (ii) correspondence – Head of Research and Road Safety Analyst; (iii) Driver2020 web information; (iv) correspondence - Chief Scientist for Behavioural Sciences and Human Factors at the Transport Research Laboratory