Developing applied behaviour change interventions to improve healthcare and reduce health inequalities

E R Bull

PhD 2020

Developing applied behaviour change interventions to improve healthcare and reduce health inequalities

ELEANOR ROSE BULL

A thesis submitted in partial fulfilment of the requirements of Manchester Metropolitan University for the degree of Doctor of Philosophy by Published Works

Department of Psychology

Manchester Metropolitan University

2020

Contents

Dedication

I would like to dedicate this thesis to Pearl Stewart, most stotter quine in Aberdeen! In her colourful long life she was many things to many people: an amazing jazz singer, dedicated Mum, Granny and Great Granny, published poet, canny antiques dealer, accomplished flirt and much more! To me she became an adopted Granny, coming into my life as part of a befriending scheme and leaving as a friend, when she away aged 92 on Easter Monday 2020 in the first few weeks of the COVID-19 pandemic. Pearl was an expert psychologist by experience and knew so much more about behaviour change and mental health than you could ever read in a book. Thank you for sharing your tales of life and love and your wisdom with me during our time spent together.

Acknowledgements

I feel hugely fortunate to have the support of phenomenal colleagues, mentors, family and friends throughout this 10-year research journey, so this section is rather long and unwaveringly mushy!

My heartfelt thanks firstly go to my parents Harry and Shirley Bull. After sparking a love for learning long ago ('Go and look in your encyclopaedia!') they have cheered me enthusiastically along every step of this PhD. Thank you especially to my wonderful Mum (and co-investigator!) for instilling a passion for social justice and a psychological lens on the world and to my excellent Dad for showing me how to be (at least a bit!) patient and methodical. Thank you also for lending me your garden hammock for peaceful writing – it has been my constant support and hasn't 'let me down whilst writing up'! Thank you also to my wider family, especially for encouraging me to follow a small way in my late great Professor Uncle Pat's footsteps.

My deep gratitude goes to four inspirational health psychology mentors: Professor Marie Johnston (Queen of Acronyms and of Health Psychology!), Dr Andy Keen, Professor Jo Hart and Professor Lucie Byrne-Davis. I am forever indebted to you for welcoming me into the health psychology community, for expertly mentoring me in my first 10 years as a health psychologist and for sharing in the excitements and frustrations of putting health psychology into practice. My deep thanks also to my PhD advisor Professor Marc Jones who has expertly guided me this year whilst writing up my PhD by publication.

Thank you to all of the fantastic psychology friends and colleagues I have had the joy of meeting over the past 10 years, who do so much to make a difference to people's health and wellbeing. Special thanks to Dr Hannah Dale, Dr Kirsty MacLennan, Hope Clayton, Holly Martin-Smith, Periklis Papaloucas, Corina Mason, Dr Nim Dharni, Dr James Doodson, Dr Nicola McCleary, Dr Rohan Cook, Dr Mandy Larkin, Dr Elaine Cameron, Dr Kiera Bartlett and Dr Lorna McWilliams. Thank you also to my awesome non-psychology friends for being a wonderful breath of fresh air. To my brilliant multi-disciplinary colleagues I have learned so much from: especially the incredible Sarah Cavanagh, along with Fran Garraghan, Stephen Doherty, James Norman, Dra Zeferina Simiao, Luana Venramel-Santos and Drs Sanga and Kaino.

Finally, a huge thank you to my incredible boyfriend Lawrence, for putting up with all the psychology chat and for providing endless cups of tea and biscuits, card games at unsociable hours, baseball lessons and delicious dinners throughout this writing up process.

Abstract

Improving public healthcare quality and reducing health inequalities are two major challenges for population health in the 21st century. Health initiatives require members of the public or their healthcare professionals to do things differently, so effective interventions to encourage health behaviour change (HBC) are needed. To accelerate behavioural science, psychologists recently developed the Behaviour Change Wheel (BCW) method and related Behaviour Change Technique Taxonomy (BCTT) tool. These help to systematically design and describe theory-based HBC interventions. This thesis presents some of the first research to apply and further develop the BCW and BCTT. I conducted seven applied research projects whilst embedded in multidisciplinary healthcare teams as an academic-practitioner health psychologist to help 'set the wheel in motion'. Most took place in the UK; one applied the BCW in Mozambique. Three projects were with vulnerable groups at risk of health inequalities, exploring healthy eating, physical activity, smoking and sexually transmitted infection testing. Four projects were with health and social care professionals and focussed on their HBC conversation skills, medication safety, integrated team working and other healthcare quality improvements. Research methods included a systematic review with meta-analysis to identify effective intervention components, cross-sectional questionnaire research exploring psychological influences on behaviour, an observational study of training and pragmatic mixed-methods action research piloting new BCW interventions. These resulted in nine peer-reviewed publications and accompanying translational materials. Collectively, this programme of research A) identified new target populations, B) described and evaluated existing interventions, C) identified behaviours and psychological influences on change for key problems, D) developed new interventions bringing about positive changes in participants' confidence, intentions and health behaviours and E) offered tools and guidance to optimise the BCW and BCTT's feasibility for use in frontline healthcare. This work contributes knowledge to help translate psychological science into usable forms and co-develop feasible, theory-based HBC interventions.

Chapter 1: Introduction

This introductory chapter sets the context for the publications presented in the thesis. I present a critical literature review of health psychology as applied to public healthcare and health inequalities. This emphasises the importance of a psychological understanding of the behaviour of those in the healthcare system, both the health and social care professionals working within public healthcare systems and members of the public interacting with them. I then introduce recent advancements in health psychology theories, tools and methods for developing health behaviour change interventions in applied settings. This focusses on the development of the Behaviour Change Wheel method (Michie, van Stralen & West, 2011) and related Behaviour Change Technique Taxonomy tool (Michie et al. 2013). Finally, I indicate how the publications presented in this thesis contribute to this field, providing a more detailed rationale and overview of the aims of the thesis.

1.1 Healthcare in the 21st century

Over the past century, population health and healthcare has improved dramatically worldwide. In 1913, on average an individual could expect to live only until their 34th birthday (Riley, 2005); in 2019 the global average life expectancy was 72.6 years (United Nations (UN), 2019). Thanks to national and international coordinated efforts, many countries have achieved and exceeded their health-related millennium development goals with demonstrable improvements in maternal health, HIV/AIDS prevalence and child survival (UN, 2015). Improvements in Universal Health Coverage over the past 30 years have been so successful that international health policy now focuses on improving the quality, rather than solely availability, of healthcare delivered (Mensah Abrampah et al. 2018; World Health Organisation (WHO), 2018). There have also been major leaps forward in innovative healthcare technologies such as use of artificial intelligence to diagnose, treat and prevent diseases. However, there are several major challenges for population health in the 21st century. Two of these, the focus of this thesis, are the related issues of improving healthcare quality and overcoming health inequalities (WHO, 2013). In both cases, it is argued that understanding human behaviour and its psychological influences is fundamental to surmounting them.

1.2 The challenge of improving healthcare quality

Across countries, progress in increasing public healthcare quality is not incremental or systematic, with global difficulties in implementing healthcare change. Research suggests that 30-45% of healthcare delivered is not in line with best clinical evidence (Grol, 2001; McGlynn et al., 2003). An average lag of 17 years between health intervention development and implementation of findings in routine care is also often cited (Morris, Wooding & Grant, 2011). Furthermore, according to some research, up to 25% of health professional practice behaviours may be unnecessary or even harmful (Grol, 2001). To illustrate, despite detailed national guidelines on the safe and effecive use of medical drugs, an estimated 1.8 million serious prescribing errors occur in England each year (NHS England, 2014a). In low-income countries, the prevalence may be similar or higher given health professional, medicine and equipment shortages (Donaldson, Kelley, Dhingra-Kumar, Kieny & Sheikh, 2017). Whether prescribing a new drug, referring to a new service, using a new diagnostic test or interacting with patients differently in a consultation, each new guideline or health innovation requires a myriad of professionals in the healthcare system to make changes to what they routinely do at work (Presseau et al. 2019). The lack of appreciation of the complexity of healthcare professional change has led authors to describe medicine as "*all breakthrough, no follow-through*" (Woolf, 2016, p.1). For instance, health leaders may assume that if health professionals gain knowledge, they will implement a healthcare innovation successfully, but knowledge alone is rarely sufficient to instigate lasting changes in human behaviour (e.g. Michie et al. 2011). For a given innovation, it is important to understand who will need to do what differently and address factors such as professionals' perceptions of time pressures, attitudes towards the new innovation, and contrasting habits, drives and routines which may be a barrier to change (Francis & Presseau, 2019). Such an understanding of the behaviours involved in change and their psychological influences may help health leaders and educators to develop targeted support to overcome barriers to healthcare improvement such as training or organisational change initiatives (Eccles & Mittman, 2006). As a leading USAID advisor argued, "*we will not have effective and sustainable health systems, nor achieve our ambitious global health goals, without seriously addressing behavior change"* (Shelton, 2013, p.137).

1.3 Overcoming health inequalities

In addition, in the 21st century healthcare quality is not improving equally for all. For instance, globally, under-five mortality rates are almost twice as high for children from the poorest households as those from the richest (WHO, 2013). Income, geographic location, employment status, education, housing, disability, ethnicity and gender are well-recognised and related social determinants of health and health inequalities (Marmot, 2010, Curl et al. 2015). One factor which is particularly strongly correlated with health outcomes is a person's position on the sociological dimension known as socioeconomic status (SES). SES is defined as an individual's combined economic and social status (House, Kessler & Herzog, 1990) and is usually measured by a person's individual or household income, education level or occupation. People in the lower parts of the spectrum of SES are more likely to suffer ill health across the lifespan. As part of this, people of lower SES have a higher risk developing chronic health conditions such as cardiovascular diseases, respiratory diseases and some cancers than those with a higher SES (e.g. Loucks et al. 2009; Robbins, Vaccarino, Zhang & Kasl, 2005; Ward et al. 2004). When living with chronic health conditions such as asthma or diabetes, people of lower SES are also more likely to suffer acute complications and require emergency treatment than those of higher SES (e.g. Bacon, Bouchard, Loucks & Lavoie, 2009; Booth and Hux, 2003; Louwman et al. 2010). Despite being one of the wealthiest countries in the world, the UK is one of the most unequal in terms of income distribution, with health outcomes strongly influenced by social position (Wilkinson & Pickett, 2009, 2019). Worryingly, the latest UK statistics suggest that the 100-year trend towards better population health and reduced inequality has reversed and such social health inequalities are now widening (Office for National Statistics, 2020).

The mechanisms by which unhealthy environments across the life course 'get under the skin' to cause ill health are complex and multifaceted (Taylor, Repetti & Seeman, 1997), reflecting a biopsychosocial model of health (e.g. Engel, 1980). Amongst these, diverse health behaviours show a similar social patterning as with health outcomes, from physical activity and healthy eating, smoking and alcohol to taking part in sexual health screening and adherence to medications (e.g. Gast & Mathes, 2019; Lau et al. 2016; Mokdad, Marks, Stroup & Gerberding, 2004; Whitley, Batty, Hunt, Popham & Benzeval, 2014). Behaviours have

therefore been suggested as important modifiable mediators of the relationship between social position and health outcomes. Equally, improvements in these health behaviours have been shown to improve health within the population. For instance, reducing excess weight in pregnancy through diet and exercise can substantially reduce the risk of poor perinatal outcomes among obese pregnant women (Bogaerts, Ameye, Martens & Devlieger, 2015). Stopping smoking can halve cardiovascular risk within a year and improve life expectancy at any age (Doll, Peto, Boreham & Sutherland, 2004). Where people have a chronic health condition, adopting healthy 'self-management' behaviours such as physical activity, healthy eating, medication adherence and effective communication with healthcare providers can substantially improve health outcomes and quality of life (Carpenter, DiChiacchio & Barker, 2019; Nuñez, Keller & Ananian, 2009). As such, understanding how to effectively support members of the public to change health-related behaviour is a major focus of public health research and government policy (Murray, 2015). Indeed, Gruer and colleagues argued that "*the scope for reducing health inequalities related to social position […] is limited unless many smokers in lower social positions can be enabled to stop smoking*" (Gruer et al. 2009, p.5).

A range of interventions have been proposed and implemented to try to encourage individuals to adopt health-promoting behaviours. These range from mass media campaigns and changes to taxation and legislation (Wanless, 2002; Scottish Government, 2008; Department of Health and Social Care, 2020), to advocating for frontline health and social care professionals to initiate supportive conversations about health behaviours (known as 'brief interventions') in their routine consultations (e.g. NHS England, 2014b; The Scottish Government, 2012). Yet many tested health behaviour change interventions have lacked effectiveness, especially among low SES groups, who are reportedly 'hard to reach' and benefit less from general population interventions (Hiscock, Bauld, Amos, Fidler & Munafo, 2012). These issues are crucial to consider since differentially effective interventions can inadvertently widen health inequalities, a phenomenon known as 'intervention-generated inequalities' (White, Adams & Heywood, 2009). One widely adopted public health solution is to offer some programmes solely to those with the lowest SES or those thought to be at-risk of poor health outcomes, to help redress inequalities in health-related behaviours and outcomes (Michie, Jochelson, Markham & Bridle, 2009). For this to be effective, it is essential to understand how effective current interventions for these groups are and to understand

the complex realities of change through identifying psychological influences on behaviour and effective change targets. Without this understanding, interventions may be directed at ineffective psychological constructs (Adler, 2009) and professionals delivering interventions may damage their relationship with low SES clients, potentially affecting their use of healthcare in future (Becker & Newsom, 2003).

In summary, the users and providers of healthcare are human beings, so the understanding of behaviour and its psychological influences behaviour is central to the challenges of improving healthcare and reducing pervasive health inequalities (House of Lords, 2011). The field of health psychology is one of the behavioural science disciplines which has been deeply involved in these issues. Health psychology is known as the scientific study of psychological and behavioural processes in health, illness and healthcare (Johnston, 1997). Health psychology evolved from clinical psychology and other social sciences in the 1970s and 1980s (Murray, 2014) to focus on psychological and behavioural aspects of physical health. Over the past 40 years, health psychologists have applied and further developed psychological theories of behaviour to contribute to efforts to improve healthcare and reduce health inequalities. This aim has been to try to understand, predict and change the health-related behaviours of both members of the public and their health and social care professionals (Johnston & Dixon, 2010). More recently, health psychologists have moved beyond applying individual theories to developing integrative tools and methods to better design, describe and evaluate interventions. What follows is a brief summary of such psychological theories and two of the integrative tools and methods, followed by the particular contribution of this thesis.

1.4 Applying psychological theories of behaviour

Development, testing and refinement of theory is a core aspect of all scientific disciplines (Popper, 1963). Theory has been defined as "*a systematic way of understanding events or situations. It is a set of concepts, definitions and propositions that explain or predict these events or situations by illustrating the relationships between variables"* (Glanz & Rimer, 2005, p.4). The process of development, testing and refinement over time aims to lead to "*a steadily richer and more potent picture of how things work*" (Clarke, 1987, p.35). Theories therefore also guide intervention designers to identify a) key psychological processes to target in

interventions because they are likely to influence behaviour, b) techniques to use for change and c) ways to understand why an intervention may have been effective or ineffective in changing behaviour (Prestwich, Kenworthy & Conner, 2017). Some of the main work of the discipline of health psychology, as one of the behavioural sciences, has been to develop, test and refine psychological theories to understand health-risk behaviours and develop interventions to change them (Adler 2009; Quinn, Chater & Morrison, 2020).

Many of the most commonly applied theories in health psychology stem from early learning theories such as Operant Learning Theory (Skinner, 1953). Operant learning theory proposed that behaviour is learned and maintained by external or internal consequences of behaviour and the antecedent events or situations preceding it. The investigations of these researchers made much progress in establishing how antecedents and consequences can be altered to achieve behaviour change (Johnston, 2016). Among many applications, these theories, for instance emphasised the importance of scheduling incentives and rewards (e.g. a person planning to treat themselves to their favourite TV show *after* their jog), and the use of behavioural cues and reminders when changing habits (Johnston, 2016; Michie, Johnston et et al. 2008). Incentives and rewards have been applied in a wide range of interventions from those promoting healthy eating and smoking cessation in young people (e.g. Corepal et al. 2018), to physical activity in people who are at risk of developing type 2 diabetes (Michie, Hardeman et al. 2008) and financial incentives for health professionals to implement changes to quality of healthcare (Casalino et al. 2003).

In the 1970s and 1980s, the field of health psychology began to apply theories from social psychology such as Social Learning Theory (Bandura, 1971), which emphasised the role of vicarious learning from others in building self-efficacy for change. Psychologists also applied socio-cognitive models such as Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Theory of Planned Behaviour (Ajzen, 1985) and Control Theory (Carver & Scheier, 1998). These propose that motivation (Intention or Goal Setting) is the main driver of behaviours, which in turn is influenced by concepts such as a person's beliefs about likely consequences of behaviour (Attitudes), perceived social pressure (Subjective Norms), beliefs about the power of barriers (Perceived Behavioural Control), and the influence of feedback (Self-Monitoring and Feedback from others). Further theories specifically developed for the health

domain include the Health Belief Model (Rosenstock, 1974), Common Sense Model of Illness (Meyer, Leventhal & Gutmann, 1985), Transtheoretical Model (Prochaska & Diclemente, 1983) and Health Action Process Approach (Schwarzer, 1999). These add health-specific psychological constructs such as a person's perceived susceptibility to negative health consequences of a behaviour, (Rosenstock, 1974). They also discuss dual coping responses in the face of concerning health information (Leventhal, 2003), propose that health behaviour change interventions should be matched to a person's motivation level (Prochaska and Diclemente, 1983) and suggest planning as a way to translate intentions into behaviour change (Schwarzer, 1999). Most recently, dual processing models (e.g. Strack and Deutsch, 2004) have been applied to help emphasise the automatic, 'non-intention' based drivers of many of our health-related behaviours. These include habits, responses to environmental cues, emotion states and cognitive biases.

Collectively, these theories have been applied to predicting and changing a wide range of health behaviours in various at-risk populations globally. These include physical activity among pregnant Latina women (Black, Kieffer, Villarruel & Sinco, 2007), to condom use among men who have sex with men (Teng & Mak, 2011), to sleep hygiene in students (Todd & Mullan, 2013) and medication adherence in people with HIV (Banas, Lyimo, Hospers, van der Ven & de Bruin, 2017) amongst many others. Some high impact interventions arising from this include social cognitive theory-based soap operas which became popular in many low and middle income countries in the 1990s. Viewers' vicarious learning from characters in the show led to demonstrable behaviour changes especially among poorer citizens, with increases in countries' literacy rates and use of family planning methods (Bandura, 2003). Other psychologists have applied theory to analyse and refine existing interventions. An analysis by Abraham et al. (2002) found that public health leaflets promoting safer sex needed to include a greater number of messages to change attitudes (which are highly correlated with contraception use) and fewer messages aiming to increase knowledge (which are not highly correlated with contraception use). Health psychology researchers have also applied understanding of avoidant, emotion-focussed coping (Leventhal, 2003) to explain why the common strategy of using threatening communications in public health interventions (motivating change through fear appeals, such as the HIV campaigns in the 1980s) tends to be ineffective and can even increase unhealthy behaviour (Peters, Ruiter & Kok, 2013). In the

health professional change domain, psychologists have used social cognitive theories and evidence to elucidate the practitioner competencies required to deliver brief behaviour change interventions for smoking cessation (Michie, Churchill & West, 2011). Further researchers have studied the theoretical mechanisms of Audit and Feedback, a common healthcare intervention in which professionals receive a summary of clinical performance over time in order to motivate change in behaviour. Health psychology researchers applied the constructs of Control Theory (Carver & Scheier, 1998) and were able to recommend that all feedback be accompanied with a comparison to a behavioural target and clear action plans (Gardner, Whittingon, McAteer, Eccles & Michie, 2010, Ivers et al. 2014).

Overall, analyses suggest that theory-based behaviour change interventions tend to be more effective than those developed using solely an empirical or pragmatic approach (Albarracin, Gilete, Earl, Durantni & Moon, 2005). Of course, a health intervention may not be explicitly theory-driven, but nonetheless based on experienced practitioners' highly effective intuitive understanding of psychology and related behavioural sciences. However, many more interventions have been argued to be less thoughtfully designed and lack effectiveness for this reason, such as discussed here:

> *Interventions are often designed according to the It Seemed Like A Good Idea At The Time' (ISLAGIATT) principle. This means that we jump straight to intervention and crucially miss out understanding the behaviours we are trying to change, what is maintaining and initiating these behaviours, and what might be a facilitator to enabling the desired behaviour*. (Atkins et al. 2016, p.74).

As such, the Medical Research Council (MRC) official guidance on Developing and Evaluating Complex Interventions argues that "*best practice is to develop interventions systematically, using the best available evidence and appropriate theory*" (Craig, Dieppe, Macintyre, Michie, Nazareth & Petticrew, 2008, p.8). This proposes a systematic, staged and cyclical process for developing health behaviour change and other multi-facetted (and thus complex) interventions, outlined in figure 1. This starts with development of an intervention based on available theory and evidence, followed by the researcher conducting a series of feasibility and pilot studies, before large-scale evaluative trials. If interventions are proved effective and cost-effective, the guidance advises intervention designers to move towards wider

implementation in routine practice, with ongoing monitoring eventually resulting in further development work.

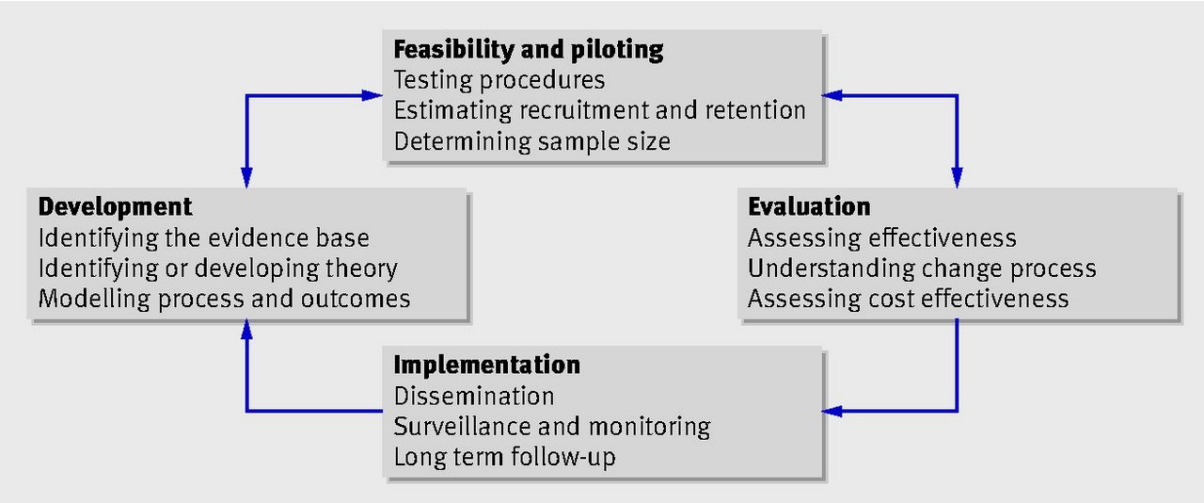

Figure 1: Medical Research Council framework for complex intervention development (from Craig et al. 2008).

1.5 The need for Systematisation in Health Psychology

Despite this progress and recommendations, in the first part of the 21st century, use of psychological theory to design behaviour change interventions was still rare (Kok, Schaalma, Ruiter, Van Emplelen & Brug, 2004; Grimshaw et al. 2004). Health psychology researchers reflected on some shortcomings in the field which limited their impact. Firstly, meta-analyses of predictive studies with individual social cognitive theories suggested that because they are parsimonious, they each explain only a limited amount of variance in health behaviours, neglecting the complexities of the many influences on an individual's behaviour in real time (Webb & Sheeran, 2006; Sniehotta, Presseau & Araújo-Soares, 2014). Despite substantial overlap between the more than 80 existing theories of behaviour change, there was also no simple overarching theoretical framework summarising the main shared concepts (Michie, West et al. 2014). Furthermore, theory had been most often used to explain and predict rather than change behaviour. There has been little guidance on which theory to use in which circumstances and no clear link between theory and choice of intervention techniques nor how to apply them successfully (Michie, Johnston, Francis, Hardeman & Eccles, 2008). A final barrier to the science of behaviour change was a lack of a shared language to describe the

'active ingredients' of theory-based health behaviour change interventions. The term active ingredient is often used to refer to the components or techniques within an intervention that make the intervention effective (McCleary, Duncan, Stewart & Francis, 2013). In medicine this might be a surgical procedure (e.g. right knee arthroscopy) or name of drug (e.g. 500mg paracetamol). In a behaviour change intervention it could be a facilitator suggesting a person set goals for physical activity or self-monitor their alcohol consumption to promote change. A study comparing reports of trials (McCleary et al. 2013) found that specific active ingredients of interventions were named in 95% of drug trials but only 56% of behaviour change trials. Behaviour change trials contained vague terms such as 'counselling', or 'educating patients' (Michie et al. 2013). If theory-based health behaviour change interventions cannot be described using commonly agreed language, it is difficult to replicate, evaluate or build upon them, hampering the development of a cumulative science of behaviour change (e.g. Michie & Prestwich, 2010). This complexity and lack of systematic methods also meant that the science and technology of behaviour change was of limited use to non-psychologists working in applied settings to design interventions and plan policy (Michie et al. 2011). At the time, few health psychologists were embedded in applied health contexts, so theory-based interventions were mainly restricted to funded, large-scale research projects using academic psychological expertise (Quinn et al. 2020).

To improve this situation and psychologists' ability to meaningfully contribute to improving healthcare and reducing health inequalities, pioneering groups of academic health psychologists in the UK and internationally began a movement known as the systematisation of health psychology (Ogden, 2016). This included developing tools and methods for psychologists and other intervention designers to be able to systematically develop, test and describe theory-based behaviour change interventions. Two of the most prominent of these are a tool called the Behaviour Change Technique Taxonomy (BCTT, Michie et al., 2013) and a related method known as the Behaviour Change Wheel (BCW, Michie et al. 2011). Both were developed through international consensus in projects led by Professor Susan Michie and Colleagues from The Centre for Behaviour Change at University College London. Since their publication less than 10 years ago the BCTT and BCW have become well known and influential across many areas of behaviour change. For instance their main publications have been cited 2974 and 2211 times respectively at the time of writing (July 2020). The research

presented in this thesis, conducted from 2011-2020, was some of the first to apply and study the BCTT and BCW in healthcare settings and explore their feasibility in improving healthcare and reducing health inequalities. What follows is a brief summary of the BCTT and BCW, before an overview of the thesis.

1.6 A tool for behaviour change: The Behaviour Change Technique Taxonomy

Following early efforts to develop taxonomies of techniques for individual behavioural areas (e.g. Michie, Abraham et al, 2009) the BCT Taxonomy project was funded by the Medical Research Council to develop a generic, internationally agreed taxonomy of BCTs used in behaviour change interventions. A behaviour change technique (BCT) is defined similarly to an active ingredient, as "*an observable, replicable and irreducible component of an intervention designed to alter or redirect causal processes that regulate behavior*' (Michie et al. 2013, p.23). BCTs can be used alone or in combination (BCTs labelled 2.2 *Feedback on Behaviour* with 1.4 *Action Planning* in the earlier case of audit and feedback interventions) and are identifiable within all types of behaviour change interventions. BCTs could be identifiable in the wording of health legislation, in the content of a persuasive letter encouraging appointment attendance or within the efforts of a parent to remind a child to brush their teeth.

To develop the BCTT, firstly, the study team generated a prototype classification system based on a thorough literature review of theories, psychological treatment manuals and intervention descriptions. This list of unique BCT labels and definitions was then refined iteratively by international panel of experts using Delphi methods (Michie et al. 2013). Further work in the project involved teams of raters coding intervention descriptions using the new list of BCTs for the purpose of interrater reliability testing, before expert participants sorted the list into groups via their mechanism of change to form a hierarchical structure. The resulting BCT Taxonomy (v1) contains 93 BCTs in 16 groups (based on theoretical mechanism of change such as Antecedents). It was named version 1 to acknowledge that it would be likely refined and improved over time (Michie et al. 2013). The overview page of BCTT version 1 is included in appendix 1.

1.7 A method for behaviour change: The Behaviour Change Wheel

At this time, in another project by this pioneering group, the BCW was developed. This aimed to provide both a coherent framework of behaviour change and method for developing theory-based health behaviour change interventions (Michie et al. 2011; Michie, Atkins & West, 2014). To develop the BCW, the study team conducted a systematic literature review and evaluation of behaviour change theories and 19 previous intervention frameworks from across the behavioural and social sciences, synthesising common features into a new comprehensive framework, linked to a broad model of behaviour and a step-by-step method.

The resulting BCW framework (figure 2) has three layers, including 'sources of behaviour' (a summary of theoretical psychological influences on behaviour) that could be targets for intervention, nine 'intervention functions' (methods of changing behaviour such as through restructuring the environment) to change these, and seven 'policy categories' (higher level sources of enabling support such as legislation).

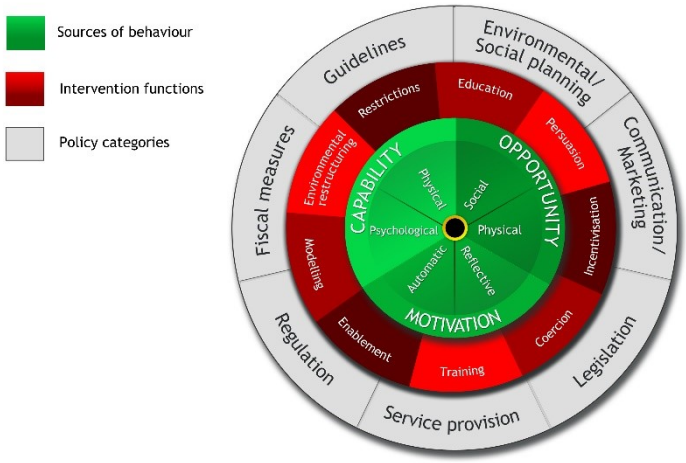

Figure 2: The Behaviour Change Wheel (from Michie et al. 2011)

The hub of the wheel is known as the COM-B model, a synthesis of many of the psychological theories discussed earlier. In COM-B, a person's Behaviour (B) depends on their perceived

Capability (C), Opportunity (O) and Motivation (M). Capability includes *psychological capability* (knowledge and skills) and *physical capability* (physical ability) to perform a behaviour. Opportunity includes *physical opportunity* (a person's perceptions of resources or barriers in the physical environment) and *social opportunity* (social and subjective norms, perceived social pressure or support from important others). Reflecting dual process models, 'M' of COM-B includes both *reflective motivation* (intentions formed through perceptions of costs and benefits of a behaviour) and *automatic motivation* (non-decisional associative processes such as habits, desires, impulses, drive states and emotional reactions) (Michie et al. 2014).

The step-by-step method for designing a theory-based behaviour change intervention proposed by the BCW authors is illustrated in figure 3. In brief, this involves an intervention designer firstly understanding a particular health problem (e.g. rising COVID-19 infection rates in a nursing home) in behavioural terms (e.g. handwashing, social distancing, restriction of visitors, use of protective equipment, using tissues to catch coughs). Following this, a key impactful behaviour to change must be selected (e.g. handwashing) and specified in terms of who should do what and when (e.g. staff handwashing with soap and water before and after touching a resident). Then a 'COM-B' analysis takes place using existing evidence, or collection of data to understand which of C,O and/or M would be useful targets for change (e.g. observation of staff suggests many are not skilled in effective handwashing – psychological capability). Next the intervention designer must selected a linked method of change (e.g. staff training including practicing handwashing in line with guidelines) and any supportive policy categories (e.g. guidelines displayed in residents rooms). Following this, they are guided to select BCTs using the BCTT to be used in the intervention (e.g. demonstrations of handwashing technique or staff practicing handwashing during training) and choose the mode of their delivery (e.g. an in person 30-minute training session at lunchtime led by a manager). Since a key step of the BCW method is using the BCTT, the BCW could be considered to encompass the BCTT, and so use of the BCW in the title of this thesis refers to both the BCW method and BCTT tool.

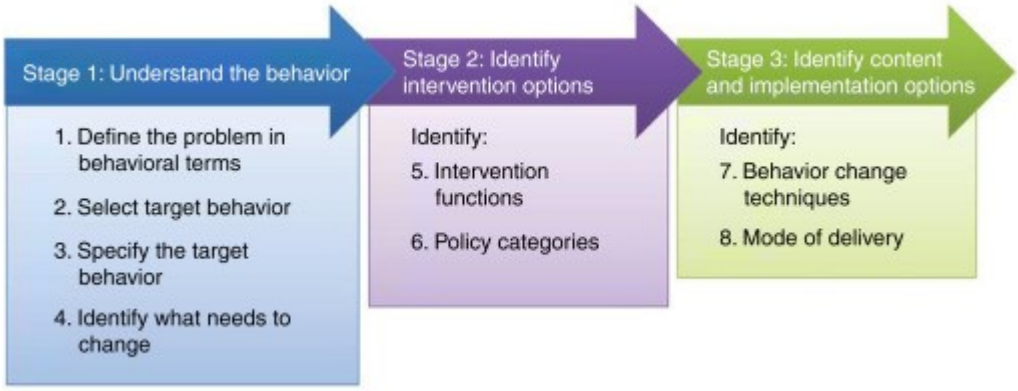

Figure 3: The BCW intervention development method (from Michie et al. 2014)

1.8 The context of the thesis

Both the BCTT and the BCW were designed to help behavioural scientists such as health psychologists to characterise and describe interventions. This was to facilitate their evaluation and further development of theory and understanding about 'what works for whom' in changing behaviour. At the time my research career began, the BCTT and BCW were just emerging, so few studies had used this theoretically valid approach to generate knowledge about psychological drivers of health-related behaviours, specify likely intervention targets or develop feasible interventions for change to improve healthcare and reduce health inequalities. As a result, guidance for designing theory-based interventions was sparse with designers advised to simply use their "*experience and creativity*" (Ajzen, 2019, p.2). The academic behavioural scientist developers also hoped the BCTT and BCW would facilitate the process of theory-based intervention design in order to "*improve the translation of research into practice*" and make behavioural science more "*useful to those designing interventions and planning policy*" (Michie et al. 2011, p.2). However, at the time I began my research career there was little published knowledge about the BCTT and BCW's use in applied healthcare settings or how to optimise their feasibility.

The development of the BCTT and BCWs coincided with the beginning of my academic-practitioner health psychology career. In late 2010, I took up a two-year post as one of the first funded Trainee Health Psychologists embedded in an NHS public health team, in Aberdeen, Scotland. My role was to apply health psychology to facilitate the development of public health projects, especially the local implementation of a national health inequalities

cardiovascular screening programme called Keep Well. Alongside this, I was able to complete the British Psychological Society's doctoral-level Stage 2 Health Psychology Qualification supervised by one the leaders of the BCTT/BCW team, Professor Marie Johnston. Professor Johnston introduced me to the in-development BCTT and BCW and invited me to become one of the trained coders undertaking some of the initial reliability work described in the BCTT publication.

I could immediately see how the BCTT and BCW could be useful in the applied settings I worked within. I began to conduct some of the first applied research to explore, apply and further develop this tool and method whilst working at the 'frontline' of health behaviour change. My passion for applied research with a clear focus on health inequalities and improving healthcare has continued as a core theme of my projects and roles in Scotland, England and overseas as part of international health partnerships. As one of the first academic-practitioner health psychologists with permanent roles in public health and other multidisciplinary healthcare teams, my work has had dual aims of a) collecting robust applied research data to add knowledge to the science of behaviour change and b) delivering impact in practice to develop and refine feasible and effective health psychology interventions. This is a challenging balance to achieve, but important to bridge the well-known evidence-practice gap (e.g. Sung et al. 2003) and to help raise awareness of the value of health psychologists as core members of the multi-disciplinary health behaviour change team.

Putting the theory-based BCTT and BCW in motion in this way through the programme of research outlined in this thesis has helped add several kinds of knowledge to the health psychology field. This includes new knowledge about target populations, psychological influences and potentially effective interventions to help members of the public and health and social care professionals change health-related behaviour. This represents a step towards overcoming the major global challenges of improving healthcare quality whilst reducing health inequalities. In addition, as some of the first applied research to apply the BCW and BCTT on the 'frontline' of healthcare, the thesis adds knowledge about how the BCW and BCTT can be used in practice to develop feasible interventions. Feasibility is a broad term relating to the practicality of interventions (Bowen et al. 2009). Maximising feasibility includes ensuring an intervention is acceptable to recipients, that there is demand for an intervention

and that it can be integrated into existing systems without needing adaptation and even when resources, time or staff commitment are constrained (Bowen et al. 2009). Feasibility testing and piloting is an essential step in complex intervention development (Craig et al. 2008) since unfeasible interventions are unlikely to prove effective in larger scale trials or ultimately be adopted in routine healthcare provision. Feasibility is also mentioned as important in the BCW guide (Michie et al. 2014) and as such is a strong focus and key theme throughout the thesis.

1.9 The projects and publications of the thesis

The thesis presents nine publications from seven applied research projects, ordered based on the chronological order in which I began the wider projects, rather than by publication date. This is to assist the overall narrative since publications varied in terms of time taken to write and publish. This also aims to best demonstrate my development as a researcher across the past decade. The research presented includes quantitative, qualitative and mixed-methods designs, applying questionnaire, observation, systematic review, interview and focus group methods as necessary in order to best answer the research questions posed (Leavy, 2017). My epistemological stance is both positivist in that it values theory and hypothesis testing, but also social constructivist in that I have viewed researchers, participants and other stakeholders as crucial to the co-development of feasible interventions.

The first two publications presented (publications 1 and 2, Bull, Dombrowski, McCleary & Johnston, 2014; Bull, McCleary et al. 2018) are from a systematic review and meta-analysis project. Herein I used the BCTT to synthesise the evidence on effectiveness and effective components of health behaviour change interventions to support people from low-income groups to change healthy eating, physical activity or smoking behaviours. This project applied novel meta-analytic techniques to explore the effect of combinations of BCT and context and delivery features. Publication 3 (Martin-Smith, Okpo, & Bull, 2018) took a different methodological approach to understanding influences on behaviour. This was a cross-sectional questionnaire study applying constructs from a variety of health psychology theories to explore psychological and demographic influences on sexual risk behaviours in university students. Together these publications used behaviour change theories and tools to contribute knowledge about influences on behaviour and potentially effective components of

interventions for vulnerable groups. This helps other intervention designers to target their efforts, but I was aware of the substantial gaps in the field's understanding of how such knowledge and intervention development methods can be used in practice. In publication 4 (Bull, Clayton & Hendry, 2017) I applied the BCW to developing and piloting a multi-disciplinary community healthy eating and physical activity intervention for women with a high body mass index (BMI) during pregnancy. The publication arising from this project included the pre-post pilot outcome data showing improvements in participants' healthy eating and physical activity during pregnancy. It also contained several recommendations for others using the BCW method in this context.

At this time in my research journey, I was working as a health psychologist in public health contributing health psychology insights to a wide range of health services, campaigns and initiatives. In nearly all projects, my multidisciplinary colleagues and I observed that the success of initiatives to improve members of the public's health depended in large part on healthcare professionals adopting new ways of working. These experiences sparked a lasting interest in applying health psychology to understand and influence health and social care professionals' behaviours, which is the focus of publications 5-9. Publication 5 (Bull & Dale, 2020) was an evaluation of a health psychology training intervention I developed, delivered to 177 health and social care practitioners to enhance their skills and confidence in having health behaviour change conversations with members of the public. This aimed to help implement the Health Promoting Health Service policy vision (Scottish Government, 2012), which proposed that a wide range of practitioners involved with hospital care should be trained to offer health behaviour change interventions as part of routine consultations, "*taking advantage of opportunities to change behaviours, especially among people most at risk of poor health*" (p1). This also aimed to reduce health inequalities since "*individuals living in deprived communities are at the greatest risk of preventable ill health because of their life circumstances… [this] offers a major opportunity to improve health and reduce health inequalities*". (Scottish Government, 2012, p1). This research project therefore contributed knowledge about how to upskill health and social care practitioners to use BCTs with vulnerable groups in practice settings. In publication 6 (Pearson, Byrne-Davis, Bull & Hart, 2018) following my own experiences as a health professional educator, I was interested to explore how the BCT Taxonomy tool could be made more applicable for non-psychologist

health professional educators wishing to develop effective training interventions. This resulted in colleagues and I developing an 'educator version' of the BCTT along with supporting translational materials, called 'Cards for Change'. In the final three publications, I applied the BCW to developing and piloting interventions for health and social care practitioners in a wider range of public healthcare contexts. In publications 7 and 8, I worked with four clinical NHS teams in the UK who were struggling with organisational change, such as an integrated psychiatric team who were struggling to work together in new ways. Publication 7 (Bull, Byrne-Davis et al. 2019) offers insights into psychological influences on teams' practices and their perceptions of 'cultural change'; publication 8 (Bull, Hart et al. 2019) reports on the feasibility of using the BCW with teams undergoing organisational change, including the importance of co-development of interventions. As part of this work, I developed translational materials such as workshops, online learning materials and policy briefings to help others to use the BCW in this context. Finally, in publication 9 (Bull et al. 2017) I explored the feasibility of applying the BCW and BCT Taxonomy in an international, low-income country setting. This was whilst working as part of an international health partnership to help health professionals to improve medication safety practices in a large hospital in Mozambique. Again, this publication contributed knowledge about psychological influences on behaviours and on the feasibility of applying health psychology theories, methods and tools to improve healthcare and reduce health inequalities.

Together the nine publications A) identified new target populations for HBC interventions, B) described and evaluated existing interventions, C) identified behaviours and psychological influences on change for key problems, D) developed and piloted new interventions bringing about positive changes in participants' confidence, intentions and health behaviours E) offered freely available translational tools and guidance to optimise the BCW and BCT taxonomy for feasible use on the frontline of healthcare. These include e-learning, educational animations, policy briefings, an educator version of the BCTT and an educational game called Cards for Change. The links between the nine publications and five contributions are summarised visually in figure 4.

1.10 Structure of the thesis

The remainder of the thesis is structured into three further chapters. *Chapter 2* includes the nine publications of the thesis, including a table detailing the timescales of each project and details of publications' study design, population and behavioural focus, along with my contribution to each. *Chapter 3* identifies and discusses the contribution of the publications to developing theory-based health behaviour change interventions in applied settings to increase healthcare quality and reduce inequalities. In *Chapter 4*, I critically discuss some key methodological and ideological challenges of this applied work and resulting strengths and limitations. For instance studying individual health behaviour change could be viewed as a reductionist or 'victim-blaming' approach to understanding health inequalities (Szaflarski & Vaughn, 2015). I would suggest that individual psychology is vital to understand how social conditions 'get under the skin' to affect people's health and to developing more holistic, contextual interventions. I then discuss my current and future research plans, including plans to deepen my knowledge of action research methodologies designed to bring about social change. Whilst only one small piece of the health puzzle, translating our science into usable forms and co-developing feasible interventions is crucial to health psychologists and other intervention developers achieving a positive impact on healthcare and health inequalities. I hope that the knowledge gained through the applied research presented in this thesis has helped us make some tracks in this direction.

Chapter 2: Publications

In this chapter, the full references for the nine publications emerging from seven projects are presented. A description of each is included in table 1. The order is roughly chronological in terms of project start dates to support the narrative of chapter 3 and indicate my development as a researcher. Due to the multi-disciplinary, collaborative nature of my research, all publications are jointly authored. In eight of the nine publications, I was the main contributor or senior author, indicated by my position as either first or last author and the high percentage contribution and information about my role agreed with my co-authors.

Table 1: Overview of relevant projects, participants, settings, behavioural focus and arising publications

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
Project 1: Health Behaviour Change in Low Income Groups A project to synthesise the evidence on the effectiveness and components of health behaviour change interventions to support people from low-income groups to change	**Publication 1** **Bull, E.R.**, Dombrowski, S.U., McCleary, N., and Johnston, M. (2014). Are interventions for low-income groups effective in changing healthy eating, physical activity and smoking behaviours? A systematic review and meta-analysis. *BMJ Open*, 4, 11, e006046. https://doi.org/10.1136/bmjopen-2014-006046	**70% Lead author, main contributor** Project lead, devising, conducting and writing up the research.	Systematic review of existing behaviour change interventions with meta-analysis.	Healthy adults with a low income in any setting.	• Healthy eating • Physical activity • Smoking
	Publication 2 **Bull, E.R.**, McCleary, N, Li, X., Dombrowski, S.U., Dusseldorp, E., Johnston, M. (2018). Healthy eating, physical activity and smoking interventions for low-income groups: a	**60% Lead author, main contributor** Project lead, devising	Systematic review of existing behaviour change	As above	As above

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
healthy eating, physical activity or smoking, to inform interventions to build on the NHS Scotland Keep Well inequalities-targeted cardiovascular screening programme.	systematic review and meta-analysis of behaviour change techniques, delivery and context. *International Journal of Behavioural Medicine*, 25(6), 605-616. https://doi.org/10.1007/s12529-018-9734-z	project, conducting research, writing up research.	interventions with meta-CART meta-analysis.		
Project 2: Sexual Health in University Students A project to explore influences on sexual risk behaviours and	**Publication 3** Martin-Smith, H.A., Okpo, E.A., and **Bull, E.R**. (2018). Exploring the psychosocial predictors of STI testing in university students. *BMC Public Health*, 18, 664. https://doi.org/10.1186/s12889-018-5587-2	**40% Senior author** Project lead devising the project, supervising	Cross-sectional questionnaire study.	University students at a large university in North East Scotland.	• Unprotected sex • Sexually transmitted infection testing

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
the uptake of sexually transmitted infection testing within university students to inform and target behaviour change interventions for at-risk students.		data collection, conducting analysis and leading writing up.			
Project 3: Bump Start intervention A project to develop and pilot a multi-disciplinary healthy living intervention to support women who were	**Publication 4** **Bull, E.R**., Clayton, H., and Hendry, T. (2017). Bump Start: Developing and piloting a healthy living group intervention for obese pregnant women. *British Journal of Midwifery*, 25, 6. https://doi.org/10.12968/bjom.2017.25.6.386	**65% Senior author** Project lead conceiving the research, data collection and analysis,	Pre-post design feasibility pilot study of a newly designed intervention.	Pregnant women in North East Scotland with a BMI of 30kg/m2 or higher.	• Healthy eating • Physical activity

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
vulnerable to pregnancy complications because of a high BMI to eat healthily and become more active during pregnancy.		leading writing up.			
Project 4: Helping People Change for Health intervention A project to develop and evaluate a health psychology training intervention for community health	**Publication 5** **Bull, E.R**., and Dale, H. (2020). Improving community health and social care practitioners' confidence, perceived competence and intention to use behaviour change techniques in health behaviour change conversations. *Health and Social Care in the Community,* 00, 1–14. https://doi.org/10.1111/hsc.13090	**80% Lead author, main contributor** Project lead, conception of study and intervention, delivery of intervention,	Mixed methods evaluation of the training intervention, including pre-post questionnaire data and	Health and social care professionals from North East Scotland, including nurses, health improvement staff, support	• Using 5 BCTs flexibly in their health behaviour change conversations with their clients, to change a

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
and social care practitioners in North East Scotland to increase their skills and confidence to have health behaviour change conversations as part of their roles, using 5 BCTs.		data collection, quantitative data analysis, leading on write-up of paper.	qualitative analysis of written feedback.	workers, physiotherapists, social workers.	wide range of health-related behaviours
Project 5: BCTs for health professional educators A project to explore which BCTs are relevant for health	**Publication 6** Pearson, E.J., Byrne-Davis, L., **Bull, E.R**., Hart, J. (2018). Behavior change techniques in health professional training: developing a coding tool. *Translational Behavioural*	**25% Co-investigator** Involved in tool development, observational	Observational study of training courses, tool development and inter-	Medical educators and health professionals (anaesthetists, gynaecologists,	• Health professionals' behaviours in an emergency, for example

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
professional educators, leading to development of an educator version of the BCTT and translational Cards for Change.	*Medicine*, 10(1), 96-102. https://doi.org/10.1093/tbm/iby125	data collection and analysis and drafting manuscript.	rater reliability analysis.	accident and emergency specialists, paediatricians, acute nurses and midwives).	calling for help, preparing drugs and equipment • Medical educators' use of behaviour change techniques during training

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
Project 6: Teams Together intervention A project to develop a BCW-based intervention for health and social care teams undergoing organisational change to implement healthcare change (e.g. health and social care integration and increased health	**Publication 7** **Bull E.R**., Byrne-Davis L.M.T., Swift J., Baxter K., McLauchlan N., Hart J.K. (2019a). Exploring what teams mean by 'culture' when implementing new models of care. *International Journal of Quality in Health Care*; 31(6), 492-494. https://doi.org/10.1093/intqhc/mzy200	**60% Lead author, main contributor** Conception of study and intervention, delivery of intervention, data collection, data analysis, leading write up of publication.	Qualitative study involving semi-structured interviews with health service leads and frontline health service practitioners	A wide range of health and social care professionals in North West England from: • An older adult acute mental health unit • A children's nursing community team • Heart failure specialist team	Improving healthcare quality by: • Engaging in cross-disciplinary recovery-focussed activities with patients • Increasing referrals from acute staff to a new specialist holistic

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
behaviour change in their roles) along with translational materials.				• Community midwifery team • Also, senior change managers from NHS trusts	children's nursing team. • Acute heart failure team beginning to run one clinic in the community per week • Community heart failure team redirecting non specialist referrals back to primary care

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
					• Community midwives starting to offer the 'flu vaccination to every pregnant woman in their care
	Publication 8 **Bull, E.R**., Hart, J. K., Swift, J., Baxter, K., McLauchlan, N., Joseph, S., & Byrne-Davis, L. M. (2019). An organisational participatory research study of the feasibility of the behaviour change wheel to support clinical teams implementing new models of care. *BMC Health Services Research*, 19(1), 97.	**60% Lead author, main contributor** Study conception, delivery of intervention, data	Mixed-methods organisational participatory research feasibility study.	As above	As above

Project description and rough date	Publication reference	Role in the publication	Study design/ methods	Participants and Setting	Behavioural focus of the project
	https://doi.org/10.1186/s12913-019-3885-8	collection, data analysis, leading write up of publication.			
Project 7: Strengthening medication safety in Mozambique A project to develop a BCW intervention to strengthen staff medication safety practice in Beira, Mozambique	**Publication 9** **Bull, E.R.**, Mason, C., Junior, F.D., Vendramel-Santos, L., Scott, A., Ademokun, D., Simiao, Z., Oliver, W.M., Joaquim, F.F., and Cavanagh, S.M. (2017). Developing nurse medication safety training in a health partnership in Mozambique using behavioural science. *Globalization and Health*, 13: 42. https://doi.org/10.1186/s12992-017-0265-1	**35% Lead author, main contributor** Design of study, data collection and analysis, leading write up.	Mixed-methods evaluation of a training intervention	Nurses in a regional referral hospital in Beira, Mozambique.	• Safe drug dose calculations • Reducing medication safety errors

Chapter 3: Contribution of publications

The nine publications presented in this thesis addressed a range of research questions surrounding developing health behaviour change interventions to improve healthcare and reduce health inequalities. The studies used the BCW method and BCTT tool in different ways, applying research methods flexibly to fit the particular research question. The particular context, research questions, methods and findings of each study are included in each publication separately. This chapter offers a critical, integrative account of the contribution of the nine publications of the thesis to knowledge and scholarship in health psychology. The combined knowledge can be summarised into five contribution themes. These themes are presented and linked to the publications in figure 4 below. Each is described in more detail in the following sections of this chapter. Along with this chapter, a summary of indicators of impact of each project is presented in appendix 2.

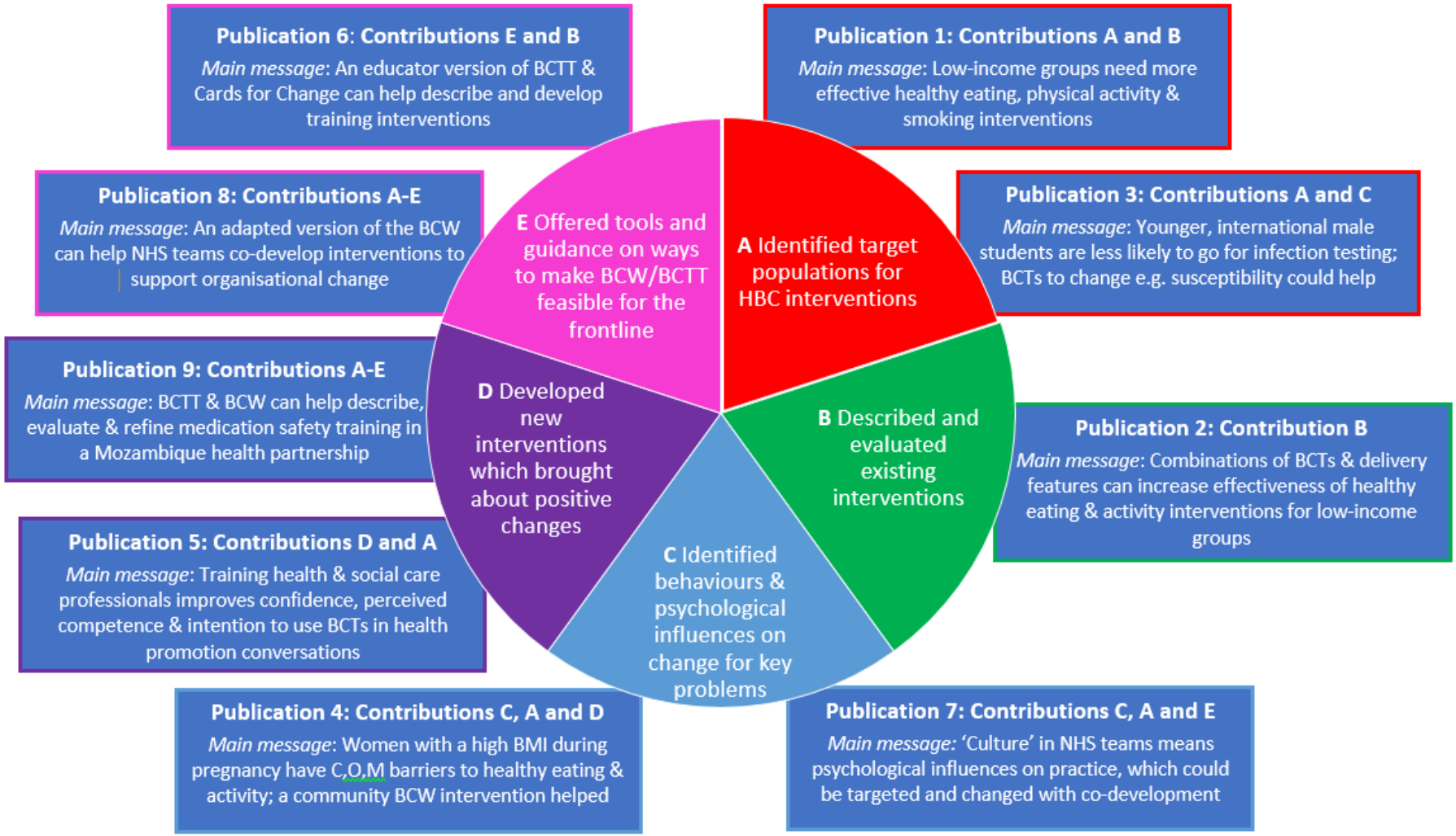

Figure 3: Thesis contributions: Linkage between the main message of publications 1-9 and five thesis contributions

3.1 Contribution A: Identified target populations for HBC interventions

In addressing a variety of health behaviour change issues as part of seven projects, the publications have drawn research attention to several key target populations for health behaviour change interventions. Publication 1's findings highlighted that healthy eating, physical activity and smoking interventions for low-income populations may have positive but small, short-term effects on behaviour change. This highlighted the need for more effective targeted interventions for low-income groups to avoid inadvertently widening health inequalities. Publication 3 identified that, at least in one university population, younger male international students may be less likely to attend Sexually Transmitted Infection testing compared to other students, suggesting a need for targeted health promotion interventions. Publication 4 raised awareness of the need for health behaviour change interventions among women at-risk of complications because of a high BMI during pregnancy.

Publications 5-9 then raised awareness of the need for a focus on the practice of communities of health and social care professionals when implementing new healthcare policies. This called attention to a need for enhanced support for a range of healthcare populations. As examples, this included social workers beginning to have health behaviour change conversations (publication 5), doctors enhancing their emergency response skills (publication 6), a newly integrated psychiatric team offering holistic recovery activities for psychiatric inpatients (publications 7 and 8) and nurses improving their medication safety practice (publication 9).

This research was published in journals spanning the multidisciplinary fields of medicine, behavioural medicine, public health, global health and health service research, to raise awareness of the need for more targeted interventions for these groups. As summarised in appendix 2, some of the publications have been relatively highly cited. For example, publication 1 has been cited in research publications (e.g. West et al. 2020), a Public Health England policy guidance document (Public Health England, 2015) and discussed by inequalities activitist Professor Richard Wilkinson as evidence of the need for more effective HBC interventions for low-income groups. In addition to being written up for publication, the findings of all projects were directly shared with project stakeholders, helping public health

and healthcare leaders target their healthcare initiatives to those who need it most.

3.2 Contribution B: Described and evaluated existing interventions

Three publications in particular applied the BCTT to characterising and evaluating currently delivered interventions, adding knowledge about their active ingredients and how these could be usefully refined. Publication 2's novel analyses using the BCTT suggested that among published Randomised Controlled Trials of healthy eating and physical activity for low-income groups, certain combinations of theory-based BCTs and active ingredients (e.g. instruction on how to become more active, in the home or in a community centre) could double effect size compared to average. The analyses also found a lack of heterogeneity in intervention components for smoking interventions, (with the main BCT being setting a quit date, *1.4 Action Planning*) pointing to the need for smoking cessation services to use and evaluate the use of a wider range of BCTs. In publication 6, we identified that medical CPD courses aimed to change 12 or more professional behaviours. Specification of behaviours helped educators reflect on what they said and did in training to focus their efforts on bringing about behaviour change. In this project, observation also highlighted 21 BCTs which educators in all courses used successfully (such as *9.1 Credible Source*) and other theory-linked BCTs which could be incorporated or refined (e.g. use of *1.1 Goal Setting (behaviour)*). This evaluation of an existing intervention helped bring about change in course delivery. In publication 9, observing existing didactic medication safety training again helped the team reflect on the key practices they wished to change, to focus their efforts on effecting change. Coding BCTs revealed that facilitators used six BCTs (e.g. *4.1 Instruction On How to Perform Behaviour*) in the original training, an important baseline to then co-develop an enhanced version with a further seven BCTs particularly aiming to address Opportunity and Motivation factors from the BCW (Michie et al. 2011).

As described in chapter 1, before the existence of a nomenclature for behaviour change, interventions could not be described in terms of their active ingredients and health professional interventions were also rarely specified in terms of key behaviours to change (Presseau et al. 2019). Publications 2, 6 and 9 were able to demonstrate some of the first use of the BCTT to describe interventions both based on coding published descriptions

(publication 2) and observing their live delivery (publications 6 and 9). For the research community, this means that these behaviour change interventions can be replicated, refined and tested, facilitating the accumulation of knowledge (Michie et al. 2013). In practice, stakeholders found it useful to take time to decide what are the key behaviours the course aimed to change and gain feedback on the active, theory-linked elements of existing interventions (Byrne-Davis et al. 2017a). Starting from where stakeholders are also recognises that feasible health behaviour change intervention development is iterative (Craig et al. 2008) and cannot be developed in a vacuum (Langley et al. 2009), which in itself helped engage stakeholders in using the BCW to refine interventions (Byrne-Davis et al. 2017b; see section E below).

3.3 Contribution C: Identified behaviours and psychological influences on change for key problems

Five of the publications added to the research community's understanding of behaviours and their psychological influences on change. In publication 3, regression analyses of cross-sectional questionnaire data suggested that self-efficacy, perceived social pressure and susceptibility were key psychological influences on risky sexual health practices and STI testing behaviours and suggested theory-linked BCTs which could help overcome barriers. In publication 4, elicitation work based on the theory-linked COM-B aspect of the BCW suggested that women with a high BMI during pregnancy may experience capability, opportunity and motivation barriers to eating healthily and becoming more physically active during pregnancy. In publication 7, we identified that in previous literature team 'culture', tended to be described in behavioural terms as 'what people do around here'. Interviews with NHS teams involved in organisational change suggested that, for them, culture may reflect the full range of C,O and M psychological influences on behaviour, such as shared goals and purpose, support or social pressure, team openness to change and automatic influences on behaviour. In the second part of this project resulting in publication 8, questionnaires, interviews and focus group methodologies helped define key practice changes which teams wished to focus on and explore psychological influences with four clinical teams. In publication 9, observations and discussions with the course facilitator and course participants revealed C,O and M barriers to change which were then the targets for BCTs in the enhanced

training. Although based on small local samples and pragmatically collected data (see chapter 4), these data provide insights for other researchers who are developing interventions for these populations on likely theory-based psychological influences on change, to develop targeted interventions for change (Craig et al. 2008). To make effective change in a complex healthcare system, individuals need to know exactly who needs to do what differently for this to be a success (Presseau et al. 2019). This work contributes several practical examples of this behavioural specification process. Our participatory methods for identifying behaviours and psychological influences have been implemented by several other health behaviour change research teams (e.g. Sneddon et al. 2020)

3.4 Contribution D: Developed new interventions which brought about positive changes

Four of the publications applied the BCW and BCTT to develop and pilot new health behaviour change interventions. Our pragmatic, pre-post design evaluations suggested that these helped participants to make some positive changes to their health-related behaviours and strengthen their confidence and intentions for change. Publication 4, focussed on development and piloting of a new BCW intervention for pregnant women with a high BMI who wished to become more active and eat healthily during their pregnancy. Development followed the BCW method, including an in-depth scoping exercise with key stakeholders to define and specify key behaviours, a COM-B analysis and exploration of feasible intervention functions and modes of delivery. Based on the scoping work and on the research findings from publication 2, I led the development of Bump Start. This six-week group programme was delivered by a health psychologist, community midwife, physiotherapist and dietician in a community centre A range of BCTs were applied, linked to the relevant COM-B influences, including those with a holistic focus such as stress management techniques. The findings of our pre-post design pilot study with 10 women suggested they made significant positive changes to their healthy eating and physical activity over the course of the intervention. For instance, mean self-reported fruit and vegetable portions per day increased from 3.12 to 7 portions among the group. This programme received further funding to continue and expand within the NHS Grampian region and, as discussed in appendix 2, we were invited by NHS Health Scotland to share this antenatal intervention for women with a high BMI with

colleagues nationally.

Publication 6 summarised the development of the Helping People Change for Health intervention and its evaluation with 177 health and social care professional participants. The course used 10 BCTs aiming to upskill participants in their health behaviour change conversation skills. Pre-post data collected suggested the training improved participants' confidence, perceived competence and intentions to use five BCTs in their practice. The project also demonstrated how BCTs could be used at 'two levels' simultaneously (used as teaching methods and also as a training target). NHS Scotland leaders and psychology colleagues from other health boards requested to observe this course and used this as a basis to develop similar interventions in other regions of Scotland.

In publication 8, Teams Together interventions were co-developed with NHS teams using an adapted BCW method tailored to the organisational development context. Interventions contained a range of intervention functions and between three and eight BCTs each. Mixed methods evaluation data suggested that interventions had helped teams implement positive changes to their clinical practice. This included, for example, improving a newly integrated psychiatric team's use of a recovery model on their inpatient ward. This work has been cited as an example of BCW implementation research (Bertilsson et al. 2020) and as summarised in appendix 2 we have recently received funding from Health Education England for several trainee health psychologist posts to scale up this intervention in other NHS Health Trusts.

In publication 9, we used elements of the BCW and BCTT to enhance an existing training intervention. Pre-post evaluation of the enhanced training with seven extra BCTs delivered to nurses in Mozambique suggested high engagement in the interactive BCT-based activities. Our findings suggested pre-post improvements in participants' intentions to double check their drug calculations using a calculator. Within and beyond the Change Exchange, colleagues have gone on to apply and further refine our approaches to co-developing interventions in global health partnership (e.g. Byrne-Davis et al. 2017a; Sneddon et al. 2020; Dharni et al., in preparation).

The interventions tested included a range of BCTs, with *1.4 Action Planning, 8.1 Behavioural Practice and Rehearsal and 9.1 Credible Source* appearing particularly frequently to be relevant, feasible to implement and showing signs of effectiveness in pre-post design evaluations. It is important to note that these tests have mostly been small pilot tests of interventions and not large-scale effectiveness trials adopting the 'gold standard' RCT methodology. This is discussed further in chapter 4. However, these studies contributed new co-developed feasible and promising interventions, ready for more robust efficacy testing.

3.5 Contribution E: Offered tools and guidance on ways to make BCW/BCTT feasible for the frontline

Finally, the body of work in this thesis has offered translational knowledge, tools and guidance on how best to use the BCW and BCTT in various settings. The need for such research in practice to facilitate use of the BCW was eloquently articulated by Professor Susan Michie, Director of the University College London Centre for Behaviour Change, in an interview with the Global Alliance for Chronic Diseases (GACD).

> *"It's up to the research community out there to really document those experiences* [using the BCW] *in a way that can find their way into publications, because then that knowledge can be accumulated and often I think we miss out on a lot of opportunities to build knowledge because people think of what they're doing as just activity instead of…data"* (GACD, 2013, 4:58).

By their nature, all of the publications 'document experiences' of various ways in which the BCTT and BCW can be used. Publication 3, 8 and 9 discuss in most depth how the BCTT and BCW can be made most feasible, including the need for co-development, starting from describing existing interventions for stakeholders, behavioural specification as the foundation for other BCW activities and the importance of language and jargon in behavioural science. In addition, colleagues and I have developed various freely-available translational tools and guidance to help educators and leaders to use BCW and BCTT in training and organisational change. These build on the original BCTT and BCW to help translate them for use in applied contexts.

- **The educator version of the BCTT**: A translational tool for health professional

educators to easily identify BCTs in their CPD and other training activities (publication 6).

- **Cards for change:** A set of colourful playing cards, each describing one or more BCTs from the educator BCTT, 'rating' the BCT's key features accessibly as seen in 'top trumps' cards, and presenting one or more ideas for how these could be used in training interventions. https://www.mcrimpsci.org/wp-content/uploads/2018/04/Cards-for-Change.pdf
- **Teams Together policy briefings:** Four accessible, infographic briefings for policy makers and health leaders on transforming culture using behavioural science, on identifying behaviours, identifying barriers and co-developing BCW interventions respectively. https://www.mcrimpsci.org/teams-together/
- **Teams Together animations and e-learning:** Freely available short engaging animation videos made with the help of a graphic designer and other e-learning activities introducing applying COM to health professional change and guiding non-psychologists on using the BCW for organisational change. https://www.mcrimpsci.org/elearningresources/helping-teams-deliver-new-models-of-care/
- **Teams Together workshop materials:** PowerPoint slides and workshop activities for various length workshops aimed at organisational development practitioners. For example: https://www.mcrimpsci.org/wp-content/uploads/2017/03/teamstogether.pdf.
- **Health Promoting Health Service website:** A website co-developed with marketing colleagues, which demonstrates translational examples of BCTs to build C,O and M to raise and discuss health behaviour change issues. This contains demonstration videos of using BCTs in practice and persuasive communications as examples of the *BCT 9.1 Credible source*, see: https://www.hphsgrampian.scot.nhs.uk/ and https://www.youtube.com/channel/UC6SoN10uF98dAWXaDEOj6Wg.

Appendix 2 summarises some of the ways these tools have helped psychologists and multi-disciplinary colleagues in health education, research, policy and practice settings to apply the science of behaviour change in their work. In summary, the knowledge shared through the

nine publications of the thesis and associated translational materials provide psychologist and non-psychologist intervention designers with direction and guidance for co-developing feasible theory-based interventions. This hopefully beyond ISLAGIATT-style advice to simply use "*experience and creativity*" (p.2, Ajzen, 2019). In the final chapter, I discuss some of the methodological and ideological challenges and limitations of the work presented, before discussing current and future research directions.

Chapter 4: Critical Reflections and Further Work

In this final chapter, I critically reflect on some of the important methodological and ideological issues inherent within the work presented in this thesis. Firstly I discuss the strengths, weaknesses and practical challenges of the research designs chosen. Secondly, I discuss ideological arguments surrounding the systematisation movement in health psychology. Thirdly I raise some key criticisms of placing a research focus on individual behaviour change. It is important to additionally note that the topics chosen and populations studied in the projects included in this thesis represent only a small slice of the full breadth of possible applications of the BCW, many of which have been discussed in Michie et al. (2014). Further critical reflection on the methods specific to each study individually can be found in the discussion section of each of the publications, in chapter 3. Following this, in this final part of this chapter I discuss and how I plan to take forward my learning as a researcher into the current and future directions of my research.

4.1 Critical reflection on the studies' research designs

As introduced in chapter 1, the MRC framework for complex intervention development (Craig et al. 2008) proposes that new complex healthcare interventions should be developed, tested and implemented in a systematic, staged process outlined in figure 1. The guidance recommends identifying relevant evidence "*ideally by carrying out a systematic review*" (Craig et al. 2008, p.8) as well as using theory to develop an intervention. After this, the guidance advocates testing, "*starting with a series of pilot studies targeted at each of the key uncertainties in the design, and moving on to an exploratory and then a definitive evaluation"* (Craig et al. 2008, p.8). The model favours assessing effectiveness through large-scale randomised experimental designs where possible, such as randomised controlled trials (RCTs):

> "*You should always consider randomisation, because it is the most robust method of preventing the selection bias that occurs whenever those who receive the intervention differ systematically from those who do not, in ways likely to affect outcomes*" (p10, Craig et al. 2008).

The studies in this thesis are broadly situated within the stages of *development and piloting of interventions* and *understanding change processes* and some did recognisably follow a staged approach. However, in most projects, I did not manage to conduct a series of staged pilot studies or plan to progress to running an RCT. From experiences as a researcher, I would suggest several practical and ideological reasons why a pragmatic and flexible approach is needed. I believe a strict interpretation of the MRC framework would be near impossible to implement when developing interventions in healthcare settings for the following reasons:

1) **In healthcare settings interventions must often be developed (and refined) quickly and economically in response to rapidly shifting policy priorities and limited funding:** For example, in the Bump Start project (publication 4) we received one year of initial funding to develop and pilot the Bump Start antenatal intervention, without knowing if further funding would become available. It was therefore not possible to plan a series of staged pilot studies leading to a larger definitive evaluation.
2) **Data and systems are not always set up to facilitate research data collection:** For instance, in evaluating the Helping People Change for Health training intervention (publication 5), I hoped to apply an RCT design collecting data from participants who were waiting for the course who would serve as wait-list controls. However, the administration support and available booking systems could not accommodate multiple data collection points or early booking. Instead, a pre-post evaluation method was seen as the only feasible option, collecting data on booking and at the end of the course.
3) **Outcome data collected must be tailored to participants' circumstances and agreed with all stakeholders:** This may be especially the case where participants may not be highly motivated to take part over time and/or may fear. For publication 5 I had planned to collect follow-up observational data on real-life use of BCTs from participants in a supportive shadowing visit to their workplace offered to all participants three months following the course. However, despite efforts to engage and reassure participants about its purpose, only nine participants took up this opportunity for a visit and only two were able to offer me a chance to shadow a conversation with a service user, despite the high completion rates for our pre-post questionnaire data collection from participants. In contrast, the Teams Together

project (publications 7 and 8), our health professional teams had been identified because of being disengaged in existing organisational change processes. Leaders told us that in this case, collecting participatory observational data and qualitative data (advising us to 'just watch and learn what they do and speak to folks') would be more acceptable and less burdensome than self-report questionnaires or using routinely collected service-level data. In one of the most initially reticent clinical teams, the team themselves decided to collect the outcome data, as they became motivated to implement and evaluate the changes they had put in place in the team.

4) **There can be ethical objections to randomisation in health inequalities settings:** This was the case in several projects I worked on within the public health directorate, including the Bump Start project (publication 4) where colleagues were unfamiliar with experimental evaluation methods. Colleagues in our project steering group argued that withholding a theory-based intervention from some vulnerable participants would be an unequitable use of government funding.
5) **Pilot to implementation leaps in leader decision making:** When deciding which new services to commission, I have observed in several roles that senior healthcare decision makers are often inclined to scale up relatively untested interventions, moving straight from piloting to implementation. As many other studies have found, decisions to implement are often based on evidence of feasibility alone (e.g. if resources are already available, leaders' view of the face validity of an intervention, perceived sustainability and speed at which it could be adopted, e.g. Huijg et al. 2013) rather than effectiveness evidence. Sometimes leaders seem very attracted to novelty, meaning that development of new interventions is prioritised over staged testing and refinement of existing interventions. Perhaps this may reflect an understandable drive towards maximising their leadership legacy, i.e. wanting to have set up a successful brand new service.

These 'in-practice' observations of the real-life process of development to implementation drove me towards a) co-development of interventions with stakeholders and b) mixed-methods research designs in the latter papers. I could then take advantage of the strengths of both qualitative and quantitative research. These designs enabled me to better understand the need for interventions, the content and context of existing interventions. I could also build

stakeholder relationships which would then facilitate them to adopt ownership over interventions and psychological theory. Qualitative evaluation methods then help to gain rich insights from their accounts about how and why they worked. These are elements which are given little attention in the MRC framework (beyond general advice to ask the question "*would it be possible to use this?*" Craig et al. 2008, p.9) but could be considered a methodological strength. As Kincheloe (2005, p.324) suggested, we must "*actively construct our research methods from the tools at hand, rather than passively receiving the 'correct', universally applicable methodologies".* An excellent recent systematic methods overview of approaches to intervention development has highlighted the wide range of ways interventions are developed in practice, which may not always align with the MRC framework's standardised approach (O'Cathain et al. 2019). Interestingly though, this categorises 'partnership' approaches in a separate category to 'evidence and theory-based' approaches. I would argue from my research experience that combining these approaches is feasible and mutually beneficial. I plan to continue to use quantitative and qualitative methods flexibly in my next research steps, whilst learning more from those who have managed to successfully run experimental research evaluation designs in frontline healthcare settings and aim to test intervention effectiveness more directly.

4.2 Critical reflection on the systematisation of health psychology

The papers in the thesis are linked by having used and further developed the BCTT tool and BCW method. These are examples of the movement in health psychology to develop systematic approaches to developing theory-based interventions, known as 'systematisation' (Ogden, 2016). This is not unique to health psychology; more widely in research authors have attempted to standardise research reporting (Schulz, Altman, Moher & Consort Group, 2010) and qualitative research methods (Brinkman, 2015) in recent years. As described in the introduction, having shared and agreed ways to describe, conduct scientific enquiry and test theories is core to the scientific tradition of steady accumulation of knowledge (Popper, 1963). In intervention design, proponents of systematisation argue that standardised methods and tools help improve the efficiency of knowledge accumulation. This means we can build on what we know, use resources well and avoid repeating what doesn't work (Presseau et al. 2019). Knowledge accumulation is core to the scientific approach, but the

drive towards efficiency and effectiveness in health psychology research in western cultures may also reflect health psychology's context as a field largely situated within western outcomes-driven healthcare systems (Brinkmann, 2015).

However, despite its wide-reaching influence, over the past few years, this approach has begun to be robustly criticised by critical health psychology researchers. For example, Peters, de Bruin and Crutzen (2015) criticised meta-analyses which explore individual BCTs as moderators of intervention effects (as in publication 2), arguing that this an invalid approach since BCTs are rarely delivered in isolation in real-life. Similarly, Ogden (2016) argued that it will be ultimately impossible to discover exactly 'what works, for whom', because of the immense variability in human behaviour and importance of context in determining intervention success. Furthermore, she felt this was undesirable, arguing that the BCTT and BCW could constrain our thinking and stifle creativity in intervention design (Ogden, 2016). In another article, Hilton and Johnston (2017) argued that flexibility, professional clinical judgement and therapeutic relationship are vital to interventions' success and are missing within the BCTT. More widely, critical health psychologists have suggested our discipline needs to become more reflexive in critically considering the goal of developing universal 'treatments' (Murray, 2015). Such a positivist approach reflects the discipline's original emergence from the biomedical field. However, for many decades they have argued that a positivist approach to studying health is not desirable, since health and illness is an individual, complex experience which is inextricably linked with our social and cultural context (Stam, 2015). Classifying, predicting and attempting to control health-related behaviour is therefore seen as reductionist (Chamberlain & Murray, 2017). Brinkmann (2015) even likened systematisation to improve efficiency in research as 'Macdonadisation'. This suggests that (akin to bland food from fast food chains) research conducted at speed and with standardisation loses out on the creative innovations which emerge from more in-depth, time-consuming, idiosyncratic research (Brinkman, 2015).

I particularly agree with the arguments which argue that we must pay more attention to the delivery of interventions, i.e. the *how* alongside the *what* of HBC. I have tried to incorporate this thoroughly in my research and practice as a health psychologist. For example, in relation to Peters et al. (2013), in publication 2 I worked to code delivery features as well as BCTs from

intervention descriptions and then applied novel methods to statistically take them into account in combination. In publications 3, 6, 8 and 9, I have tried to fully describe interventions including providing the reader with important details of the healthcare context which may have influenced their process and outcomes. In another project (Bull, Dixon & Johnston, in preparation), I worked to validate the Health Behaviour Change Competency Framework (Dixon & Johnston, 2010) with health psychologists. This framework clearly delineates BCTs from competencies needed to deliver health behaviour change interventions such as an ability to set a joint agenda for a consultation. In roles on national psychology committees, as an MSc programme director and as a supervisor of doctoral health psychology trainees, I continue to strive towards creating opportunities for trainees to develop their clinical judgement and professionalism whilst embedded in healthcare contexts (e.g. Bull et al. 2020). However, I would argue that systematisation and particularly the shared nomenclature it has provided has helped us describe what we currently do and build on what we know (Johnston, 2016). In every functioning healthcare system worldwide, interventions are constantly being developed and offered to vulnerable groups and health professionals. In my view, being able to gather and share useful information about what has and hasn't worked in different contexts can only help intervention designers be more creative and avoid 'reinventing the wheel'.

4.3 Critical reflections of a research focus on individual health behaviour change

A final ideological criticism of the papers is their focus on individual health behaviour change. This particularly relates to publications 1-4, with their more explicit focus on health behaviour change among vulnerable groups. As discussed in the introduction, an individual's health behaviours are only one influence on their health and wellbeing and the socio-economic gradient in health is not fully explained by differences in health behaviours (e.g. Marmot, 2010). Public health policy has long debated whether actions to prevent ill health should focus on unhealthy behaviour, or underlying economic and social issues affecting deprived communities (Porter, 1999). Conceptualising health behaviours such as smoking or diet as 'lifestyle choices' and working with at-risk individuals to build motivation to change has therefore been criticised as a "*victim-blaming ideology*" (Murray, 2015, p.13) because it

assumes that individuals have all control, power and resources to make meaningful changes to their health if only they could be persuaded to. Such authors argue that this approach ignores the social determinants of health or "*the conditions in which people are born, grow, live, work and age and inequities in power, money and resources"* (Marmot, Allen, Boyce, Goldblatt & Morrison, 2020, p.3). Such conditions influence health directly, as well as influencing the control people have over their health behaviours and therefore the ability to make positive changes to health (Taylor et al. 1997, d'Errico et al. 2007; Hiscock et al. 2011). Increasingly, public health policy papers have been criticised as suffering from 'lifestyle drift' (Baum & Fisher, 2014). This means that whilst papers may initially discuss these 'upstream' social determinants of health, eventual report recommendations then focus on 'downstream' individual health behaviour level interventions (Popay, Whitehead & Hunter, 2010). Government reluctance to act on social determinants may reflect perceived difficulty in tackling entrenched intersectional issues such as racism, housing and unemployment. It may also reflect their ideological stance on their role and welfare provision, or pressures from corporate industries such as multinational tobacco and food corporations who object to governments' efforts to regulate supply and marketing (Baum & Fisher, 2014).

The issue of social justice is particularly relevant currently in the UK, whose government have imposed a 10-year programme of fiscal 'austerity' with wide-sweeping cuts to public services, community facilities and a much-criticised overhaul of its social security system (Hynes, 2013). For instance, allocations of government funding to local governments reduced by 77% between 2009-10 and 2018-19 (Marmot et al. 2020). The effects on poverty levels have received international attention; for instance from the United Nations Special Rapporteur on extreme poverty and human rights Professor Alston following a visit to the UK:

> *"For almost one in every two children to be poor in twenty-first century Britain is not just a disgrace, but a social calamity and an economic disaster, all rolled into one."* (Alston, 2018, p.1).

Over the same period, population health in the UK has declined (Marmot, 2020). The UK's national life expectancy at birth is no longer increasing and for the first time in over a hundred years, the gap between the life expectancy of those living in the least and most deprived areas

of England is now increasing (Office for National Statistics, 2020). According to the analyses of renowned health inequalities expert Professor Sir Michael Marmot:

> "*This damage to health has been largely unnecessary. There is no biological reason for stalling life expectancy and widening health inequalities. Other countries are doing better, even those with longer life expectancy than England. The slowdown in life expectancy is not down to exceptionally cold winters or virulent flu, and cannot be attributed solely to problems with the NHS or social care – although declining funding relative to need in each sector will undoubtedly have played a role. The increase in health inequalities in England points to social and economic conditions, many of which have shown increased inequalities, or deterioration since 2010.*" (Marmot et al. 2020, p.4).

Furthermore, at the time of writing, low SES has been shown to be a risk factor for contracting the COVID-19 virus, because of crowded and unsafe living and working conditions (Patel, Nielsen, Badiani et al. 2020). Emerging global evidence is beginning to connect countries' wealth inequality with COVID-19 mortality rate (Chaudry, Dranitsaris, Mubashir, Bartoszko & Riazi, 2020). In the context of these stark trends, research focussing on individual psychology and patterns of health-related behaviour may seem unimportant or even passively risking contributing to victim-blaming. However, I would argue against this restrictive view of psychology in the context of public health, in two ways in particular.

First, I believe individual psychology is important because it is the means by which most social conditions 'get under the skin'. For instance, health psychology research has highlighted the importance of stressors and our reactions to them on the immune system and the likelihood of health-risk behaviours (Segerstrom & Miller, 2004). Increased stress may be one factor influencing the heightened risk of COVID-19 in low SES groups (Patel et al. 2020). Ground-breaking research has also shown that stigma, stress and distress from the very experience of feeling disadvantaged in an unequal society can affect our decision making, health risk behaviours (such as alcohol and drug behaviours) and physiological systems (such as immune response) (Wilkinson & Pickett, 2009, 2019). Other psychological research has elucidated some of the challenges disadvantaged groups experience in sourcing and effectively using high quality healthcare (e.g. Arpey, Gaglioti & Rosenbaum, 2017; Becker & Newsom, 2003; Garrett, Dickson, Young & Whelen, 2008; Saydah, Imperatore & Beckles, 2013). As well as geographic differences in quality healthcare provision between and within countries,

qualitative work with people of low SES suggests that an unsatisfactory relationship with a healthcare provider can lead to people avoiding seeking healthcare until health problems become severe and complex (Becker & Newsom, 2003). Equally, several of the most popular health psychology theories and methods explicitly discuss the link between environmental conditions, our cognitions and behaviour (e.g. Bandura, 1971, Ajzen, 1985). The COM-B model at the heart of the BCW summarises these by including Social and Physical Opportunity, which is an individual's perceptions of the pressures and resources in their physical and social environment (e.g. Michie et al. 2011). The premise of the BCW is also on making a behavioural diagnosis based on a thorough understanding of context for an individual, family, team, or whole community. Such nuanced understanding of the individual in their social context can provide a route map from social conditions to illness and so serve to combat the idea that health inequalities are inevitable, irreversible and linked to fixed factors like personality or genetics. My applied research has sought to highlight and explore participants' C, O and M in their real-life context (e.g. Publication 4, 7, 8 & 9) and to elucidate complex interactions between psychological and demographic factors (e.g. Publication 3). By explaining how what we think, feel and do affects our biology (Manstead, 2018; Taylor et al. 1997) psychology provides the essential bridge between the social and biological. In public discourse, this may help root the unfair but perhaps diffuse social differences in something more concrete, i.e. effects on physical and mental health, and therefore highlight more effectively the need for social, upstream, actions.

Second, I suggest that an understanding of psychology is crucial to building more holistic interventions. Applying psychology to understanding an individual's experience in context enables more complex, psychological approaches to interventions, building on the traditional 'education' approach to health promotion. For example, as discussed in the introduction, psychological research has helped to show when and why knowledge-based health campaigns and fear appeals are an ineffective health promotion strategy (Peters et al. 2013).

Some also argue that psychological interventions have an important place in the health inequalities landscape by supporting people's self-efficacy to make positive healthy changes. They may enable people to experience a sense of agency and learn new skills even when so much of life may be difficult and out of their personal control (South, Woodward & Lowcock,

2007). This has certainly been the experience of clients with long-term physical health conditions with whom I have worked clinically as a practitioner health psychologist. The BCW method also proposes that intervention designers explicitly consider categories of 'policy support' (the outer layer of the BCW) which are crucial to the success of health interventions. Some studies have applied the BCW to characterise and develop interventions at multiple levels (English 2013), recognising the complexity of healthcare organisations (Ferlie & Shortell, 2001). The BCW could be applied in future to understanding and changing health policy makers' behaviours (GACD, 2013). In this thesis, psychological research methods have been applied to understand where current health promotion practice is not meeting the needs of vulnerable groups (Publication 1 & 2, see appendix 2). I have worked to co-design interventions, using participatory approaches taking into account a thorough understanding of participants' psychology in their context (e.g. in publication 9). These have used a range of techniques from making changes to organisation of a ward (e.g. publication 8) and teaching stress management techniques (publication 4). Through the co-development process I could also help to voice participants' challenging experiences and the environmental barriers they faced to more senior decision makers (e.g. publications 7 and 8).

In conclusion, I believe that (good) psychological research inherently links a person with their social context. The publications in this thesis have taken into account social factors to some extent by applying the BCW and through the co-development and action research approaches applied (Van Der Veer et al. in press). Nevertheless, I agree with those who argue that psychology as a discipline must seek to have greater impact (Bajwa, 2020) and that we must learn from other disciplines such as sociology and political science to engage in more activism for positive social change (Goodley & Runswick-Cole, 2015). I hope to learn more about these approaches and bring this to future research projects, discussed in the final section.

4.4 Future research directions

In this final section, I outline my current and future research directions and priorities, in the context of emerging research in the field. These are summarised into three themes reflecting

my development as a researcher: A) global health psychology, B) testing health behaviour change interventions and C) health psychology research to promote social change in the UK.

Future research theme A: Global health psychology research

In the past few years since the Mozambique project, as part of the Change Exchange I have had the opportunity to become involved in two further global health partnership projects. The main aims have been in evaluating interventions and co-developing new interventions. However, from a health psychology applied research perspective, I have enjoyed a) exploring how our health psychology methods and measures apply in a global health system context and b) gathering feasibility data on ways of building international health psychology capacity amongst non-psychologists.

- *The Safer Anaesthesia From Education (SAFE) Obstetrics project:* In the first project Dr Nimarta Dharni and I worked with the World Federation of the Society of Anaesthesiologists https://www.wfsahq.org/wfsa-safer-anaesthesia-from-education-safe to evaluate SAFE Obstetrics. This three-day course aims to improve maternal and neonatal health in low-income countries by strengthening anaesthetic nurses' skills in providing emergency healthcare to expectant mothers and babies. We worked closely over two years with course leaders in Tanzania, Nepal, Bangladesh and Zimbabwe to design and deliver a mixed-methods evaluation based on the BCW and Theoretical Domains Framework (Cain et al. 2012). As part of this, we supported eight medical fellows from the four countries to collect data, including delivering in-person behavioural science training and providing ongoing mentoring. Three papers co-authored with our international colleagues are in preparation on *a)* the findings of the quantitative evaluation data (Byrne-Davis et al. in preparation) *b)* the findings of the qualitative evaluation data (Dharni et al. in preparation) and *c)* the process and outcomes of local capacity building in behavioural science (Bull et al. in preparation).

- *The Commonwealth Partnerships Antimicrobial Stewardship Manchester-Gulu project* The second of these is a currently ongoing project between colleagues from health and education institutions in Manchester and our counterparts in Gulu, Uganda. This aims to help strengthen hospital systems to combat the global public health challenge

of antimicrobial resistance, in two hospitals in Gulu, Northern Uganda. I was glad to have the opportunity to work on the project from its inception, helping form our multi-disciplinary team and bid for funding https://www.thet.org/our-work/grants/cwpams/ I have enjoyed co-developing and evaluating our BCW-based training intervention and other initiatives and again building behavioural science capacity among non-psychologists. Our forthcoming publication (Bull et al. in preparation) will present the findings suggesting that the antimicrobial stewardship interventions impacted on staff C,O,M and changed how they prescribe and administer antibiotics.

Other projects with the Change Exchange leads Professors Hart and Byrne-Davis include developing guidance for volunteers and health partners on health psychology's role in health partnerships, and validating a recently developed 6-item measure of COM (Keyworth et al. 2020) among African Diaspora health professionals in the UK. I hope in future to lead my first multi-disciplinary health partnership bid enabling me to strengthen my skills in research leadership and further develop, test and refine health psychology approaches.

Future research theme B: Experimental testing of BCT interventions

As previously discussed, testing effectiveness of health behaviour change interventions in applied settings carries a range of practical challenges and so studies which experimentally compare the effects of individual BCTs on health-related behaviour are rare. However, the Behavioural Insights Team, a social purpose company that is partly owned by the Cabinet Office, have managed to conduct many such trials in recent years. Among these, the team have conducted large-scale trials testing the effect of social norms feedback on GPs' antibiotic prescribing (Hallworth et al. 2016) and the effect of different types of prompt on UK road taxpayers' organ donor registrations (Sallis, Harper & Sanders, 2018). These kinds of studies involve the use of low-intensity, scalable and feasible interventions and often make use of routinely-collected data but have recorded substantial effect sizes for participants across the socio-economic spectrum. As a strand of my current and future research, I have been working with a number of colleagues and networks to begin to test the effectiveness of low-intensity, scalable BCT-based interventions, as summarised below. In some cases these have been able to make use of relatively large data routinely collected sets and have used experimental

designs. In all cases, I aim to retain my focus on co-development to ensure interventions are feasible and therefore implementable.

- *Improving attendance at GP appointments:* This was an intervention in a GP practice to explore the use of positive social norms and active commitment BCTs to encourage people to attend their GP appointments or cancel in good time (Bull, Frost and Bull, in preparation). This project was particularly rewarding as it embodied both co-development and public participation since it was by a patient from the practice's Patient Participation Group, retired educational psychologist (and excellent Mother!) Shirley Bull. It also made use of a relatively large set of routinely collected appointments data. In 2018 we were pleased to be awarded a Bright Ideas: High Impact award from the Royal College of General Practitioners for this project.
- *Low-income communities' healthy weight intervention in Salford* This is a project in collaboration with colleagues from Salford Public Health team and the University of Manchester. This aims to build on publication 2 within an existing community healthy weight intervention for low-income groups, testing whether it is most effective for people to set their action plans for healthy eating or physical activity alone or for both behaviours together.
- *Source credibility of health and social care professionals in expanded roles:* As discussed in publication 6, a wide range of health and social care professionals' roles have expanded to include routinely delivering health behaviour change interventions (e.g. Scottish Government, 2012). Professors Hart and Byrne-Davis and I have developed several projects including exploring fire fighters' perceptions of the change (e.g. Byrne-Davis et al. 2018) and whether professionals in expanded roles are still perceived by members of the public as credible sources of health information (Bull, Mills, Byrne-Davis & Hart, 2020). In future projects I will explore the BCT of source credibility further, including a) factors which make leading figures in controversial health movements (e.g. anti-vaccination conspiracy theorists) so credible and b) testing various means of increasing the source credibility of health professionals.
- *Testing BCTs within health professional training interventions:* This is a collaboration with Professors Hart, Byrne-Davis and expert colleagues in health psychology and

implementation science from Ottawa Hospital Research Institute (Presseau et al. under review, Colquhoun et al. 2017). We have planned a series of projects surrounding testing BCTs in health professional training. Currently running projects are testing the behavioural impact of adding BCTs Practice and Behavioural Rehearsal and 1.4 Action Planning to existing health professional CPD courses in the UK (Harper et al. in preparation) and Canada (McCleary et al. in preparation).

- *Teams Together stepped wedge trial:* Professors Hart and Byrne-Davis and I applied for research funding to scale up our Teams Together intervention (from publication 8) to six further NHS trusts in a stepped wedge experimental design study. We were not successful in that bid but the new NHS Health Education England-funded trainee health psychologists will be scaling up and further testing Teams Together as part of their roles whilst embedded in NHS trusts (See appendix 2), hopefully enabling various research opportunities.

Future research theme C: Health psychology research to promote social change in the UK

Finally, as described earlier in this chapter, in the coming years I hope to follow my passion for reducing health inequalities in new directions. This includes learning more about participatory action research methods and how to use health psychology research to promote social change in the UK. In 2017 I was invited to speak at a symposium at the BPS annual conference on health inequalities research. I was inspired by excellent psychological action research conducted by several researchers in the important and understudied area of refugee and asylum seeker health and wellbeing (e.g. Goodman, Sirriyeh & McMahon, 2017). Since then I have carried out some volunteer work with refugee organisations to try to learn more about the complex and growing international refugee crisis. In the next year, I hope to read more about health behaviour change research in this area, renew contact with these researchers and organisations to learn more about their action research and hopefully co-develop a funding bid in the area of health psychology for refugees and asylum seekers.

4.5 Conclusion

In this final chapter, I have reflected on several methodological and ideological strengths and weaknesses of the thesis as a whole. Issues discussed were that the papers a) focussed on co-

development of feasible interventions in practice, rather than robust tests of efficacy b) assume that we can and should attempt to build systematic knowledge of 'what works, for whom', and c) used an individual health behaviour change lens to focus on the issue of health inequalities. I have then summarised some of my main current and future research directions. This discussed recent projects to further explore health psychology's role within global health settings and how to build capacity, to experimentally test a variety of feasible and implementable health behaviour change interventions for the public and health professionals, and learn more about action research. In the coming years, I aim to learn more about robust testing of health behaviour change interventions in practical settings and learn how best to use my voice as a researcher to contribute knowledge about pressing social justice issues like the health of refugees and asylum seekers. These might seem like opposing approaches but to make a difference to pressing population issues, I feel we can and must 'square the circle'. For me this means applying high quality research methods and approaches whilst also be meaningfully embedded in the social health inequalities context of our work and listening at all times to our stakeholders' voices.

The work I have presented in this thesis contributes to our understanding of improving healthcare and reducing health inequalities. Translating our science into usable forms, applying and further developing our tools and methods and co-developing feasible interventions are crucial to health psychologists and other intervention developers achieving a positive impact on healthcare and health inequalities. The knowledge gained through the applied research presented in this thesis has helped 'set the behaviour change wheel in motion' and I look forward to helping carve out some of its future paths.

References

Abraham, C., Krahé, B., Dominic, R., & Fritsche, I. (2002). Do health promotion messages target cognitive and behavioural correlates of condom use? A content analysis of safer sex promotion leaflets in two countries. *British Journal of Health Psychology*, *7*(2), 227-246. https://doi.org/10.1348/135910702169466

Adler, N. E. (2009). Health disparities through a psychological lens. *American Psychologist, 64*(8), 663–673. https://doi.org/10.1037/0003-066X.64.8.663

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior*. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behaviour* (pp. 11– 39). Berlin, Germany: Springer-Verlag. https://doi.org/10.1007/978-3-642-69746-3_2

Ajzen, I. (2019). *Behavioral interventions based on the theory of planned behaviour.* Accessed on 23rd August 2020 from: https://people.umass.edu/aizen/pdf/tpb.intervention.pdf.

Albarracin, D., Gillette, J.C., Earl, A.N., Durantini, M.R., & Moon-Ho, H. (2005). A test of major assumptions about behaviour change: a comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic. *Psychological Bulletin*, 131(6):856-97. https://doi.org/10.1037/0033-2909.131.6.856

Alston, P. (2018) *Visit to the United Kingdom of Great Britain and Northern Ireland Report of the United Nations Special Rapporteur on extreme poverty and human rights*. United Nations.

Arpey, N. C., Gaglioti, A. H., & Rosenbaum, M. E. (2017). How socioeconomic status affects patient perceptions of health care: a qualitative study. *Journal of Primary Care & Community Health*, 8(3), 169-175. https://doi.org/10.1177/2150131917697439

Atkins, L. (2016). Using the Behaviour Change Wheel in infection prevention and control practice. *Journal of Infection Prevention*, *17*(2), 74-78. https://doi.org/10.1177/1757177415615952

Bacon, S. L., Bouchard, A., Loucks, E. B., & Lavoie, K. L. (2009). Individual-level socioeconomic status is associated with worse asthma morbidity in patients with asthma. *Respiratory research*, *10*(1), 125. https://doi.org/10.1186/1465-9921-10-125

Bajwa, S. (2020). From the Chief Executive, June 2020. The latest from Sarb Bajwa. *The Psychologist,* 33: p5. Accessed on 27th September 2020 from: https://thepsychologist.bps.org.uk/volume-33/june-2020/chief-executive-june-2020

Banas, K., Lyimo, R. A., Hospers, H. J., van der Ven, A., & de Bruin, M. (2017). Predicting adherence to combination antiretroviral therapy for HIV in Tanzania: A test of an extended theory of planned behaviour model. *Psychology & Health*, *32*(10), 1249-1265. https://doi.org/10.1080/08870446.2017.1283037

Bandura, A. (1971). *Social learning theory*. General Learning Press. https://doi.org/10.2307/1167194

Bandura, A. (2003). Social cognitive theory for personal and social change by enabling media. In *Entertainment-education and social change* (pp. 97-118). Routledge.

Baum, F., & Fisher, M. (2014). Why behavioural health promotion endures despite its failure to reduce health inequities. *Sociology of health & illness*, 36(2), 213-225. https://doi.org/10.1111/1467-9566.12112

Becker, G., & Newsom, E. (2003). Socioeconomic status and dissatisfaction with health care among chronically ill African Americans. *American journal of public health*, *93*(5), 742-748. https://doi.org/10.2105/ajph.93.5.742

Bertilsson, E., Serhal, S., Emmerton, L., Bosnic-Anticevich, S., Krass, I., Bereznicki, B., ... &

Saini, B. (2020). Pharmacists experience of and perspectives about recruiting patients into a community pharmacy asthma service trial. *Research in Social and Administrative Pharmacy*, (5), 211-215. https://doi.org/10.1016/j.sapharm.2020.05.012

Black, J. E., Kieffer, E. C., Villarruel, A. M., & Sinco, B. R. (2007). Predicting the exercise intention of pregnant Latina women. *Hispanic Health Care International*, *5*(1), 5-12. https://doi.org/10.1891/154041507780851923

Bogaerts, A., Ameye, L., Martens, E., & Devlieger, R. (2015). Weight loss in obese pregnant women and risk for adverse perinatal outcomes. *Obstetrics & Gynecology*, *125*(3), 566-575. https://doi.org/10.1097/aog.0000000000000677

Booth, G. L., & Hux, J. E. (2003). Relationship between avoidable hospitalizations for diabetes mellitus and income level. *Archives of Internal Medicine*, *163*(1), 101-106. https://doi.org/10.1001/archinte.163.1.101

Bowen, D. J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., ... & Fernandez, M. (2009). How we design feasibility studies. *American Journal of Preventive Medicine*, *36*(5), 452-457. https://doi.org/10.1016/j.amepre.2009.02.002

Brinkmann, S. (2015). Perils and potentials in qualitative psychology. *Integrative Psychological and Behavioral Science*, 49, 162–73. https://doi.org/10.1007/s12124-014-9293-z

Bull E.R., Byrne-Davis L.M.T., Swift J., Baxter K., McLauchlan N., & Hart J.K. (2019). Exploring what teams mean by 'culture' when implementing new models of care. *International Journal of Quality in Health Care*; 31(6), 492-494. https://doi.org/10.1093/intqhc/mzy200

Bull, E.R., Clayton, H., & Hendry, T. (2017). Bump Start: Developing and piloting a healthy living group intervention for obese pregnant women. *British Journal of Midwifery*; 25:6. https://doi.org/10.12968/bjom.2017.25.6.386

Bull, E.R., & Dale, H. (2020). Improving community health and social care practitioners' confidence, perceived competence and intention to use behaviour change techniques in health behaviour change conversations. *Health and Social Care in the Community,* 00, 1–14. https://doi.org/10.1111/hsc.13090

Bull, E.R., Dombrowski, S.U., McCleary, N., & Johnston, M. (2014). Are interventions for low-income groups effective in changing healthy eating, physical activity and smoking behaviours? A systematic review and meta-analysis. *BMJ Open*; 4, e006046. https://doi.org/10.1136/bmjopen-2014-006046

Bull, E.R., Hart, J. K., Swift, J., Baxter, K., McLauchlan, N., Joseph, S., & Byrne-Davis, L. M. (2019). An organisational participatory research study of the feasibility of the behaviour change wheel to support clinical teams implementing new models of care. *BMC Health Services Research*, 19(1), 97. https://doi.org/10.1186/s12913-019-3885-8

Bull, E.R., Mason, C., Junior, F.D., Vendramel-Santos, L., Scott, A., Ademokun, D., Simiao, Z., Oliver, W.M., Joaquim, F.F., & Cavanagh, S.M. (2017). Developing nurse medication safety training in a health partnership in Mozambique using behavioural science. *Globalization and Health*, 13: 42. https://doi.org/10.1186/s12992-017-0265-1

Bull, E.R., McCleary, N, Li, X., Dombrowski, S.U., Dusseldorp, E., & Johnston, M. (2018). Healthy eating, physical activity and smoking interventions for low-income groups: a systematic review and meta-analysis of behaviour change techniques, delivery and context. *International Journal of Behavioural Medicine*, 25(6), 605-616. https://doi.org/10.1007/s12529-018-9734-z

Bull, E.R., Newman, K., Cassidy, T., Anderson, N., & Chater, A. (2020). Reflecting on the Stage 2 health psychology independent training route: A survey of trainee and graduate experiences of employability. *Health Psychology Update,* 29(2), 19-30. https://doi.org/10.1007/2396-8729

Bull, E. R., Mills, M., Byrne-Davis, L. M., & Hart, J. K. (2020). Who is a credible source of preventive advice? An experimental vignette study of general public attitudes towards role expansion in health and social care. *British Journal of Health Psychology*. (online first). https://doi.org/10.1111/bjhp.12464

Byrne-Davis, L. M., Bull, E. R., Burton, A., Dharni, N., Gillison, F., Maltinsky, W., ... & Byrne, G. J. (2017a). How behavioural science can contribute to health partnerships: the case of The Change Exchange. *Globalization and Health*, *13*(1), 1-8. https://doi.org/10.1186/s12992-017-0254-4

Byrne-Davis, L. M. T., Bull, E., Burton, A., Dharni, N., Gillison, F., Maltinsky, W., ... & Hart, J. (2017b). Global Health Psychology: Research, Volunteering & Consultancy. *The European Health Psychologist*, *19*(2), 321-325.

Byrne-Davis, L. M. T., Marchant, D., Bull, E. R., Gyles, D., Dean, E., & Hart, J. K. (2019). How do members of a fire and rescue service perceive expanding their roles to deliver more health care services? *Journal of Public Health*, 41(3), 593-599. https://doi.org/10.1093/pubmed/fdy148

Cane, J., O'Connor, D., & Michie, S. (2012). Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science*, *7*(1), 37. https://doi.org/10.1186/1748-5908-7-37

Carpenter, R., DiChiacchio, T., & Barker, K. (2019). Interventions for self-management of type 2 diabetes: an integrative review. *International Journal of Nursing Sciences*, *6*(1), 70-91. https://doi.org/10.1016/j.ijnss.2018.12.002

Carver, C.S., and Sheier, M.F. (1998). Control theory: a useful conceptual framework for personality-social, clinical and health psychology. *Psychological Bulletin*, 92 (1998), pp. 111-135. https://doi.org/10.1037/0033-2909.92.1.111

Casalino, L., Gillies, R. R., Shortell, S. M., Schmittdiel, J. A., Bodenheimer, T., Robinson, J. C., ... & Wang, M. C. (2003). External incentives, information technology, and organized processes to improve health care quality for patients with chronic diseases. *Journal of the American Medical Association*, *289*(4), 434-441. https://doi.org/10.1001/jama.289.4.434

Chamberlain, K., & Murray, M. (2017). *Health Psychology.* In C. Willig & Stainton Rogers, W (Eds.), The SAGE handbook of qualitative research in psychology. SAGE Publishing. https://dx.doi.org/10.4135/9781526405555

Chaudhry, R., Dranitsaris, G., Mubashir, T., Bartoszko, J., & Riazi, S. (2020). A country level analysis measuring the impact of government actions, country preparedness and socioeconomic factors on COVID-19 mortality and related health outcomes. *EClinicalMedicine,* 100464. https://doi.org/10.1016/j.eclinm.2020.100464

Clarke, D. D. (1987). Fundamental problems with fundamental research: A meta–theory for social psychology. *Philosophica, 40*: 23– 61.

Colquhoun, H. L., Squires, J. E., Kolehmainen, N., Fraser, C., & Grimshaw, J. M. (2017). Methods for designing interventions to change healthcare professionals' behaviour: a systematic review. *Implementation Science*, *12*(1), 1-11. https://doi.org/10.1186/s13012-017-0560-5

Corepal, R., Tully, M. A., Kee, F., Miller, S. J., & Hunter, R. F. (2018). Behavioural incentive interventions for health behaviour change in young people (5–18 years old): A systematic review and meta-analysis. *Preventive Medicine*, *110*, 55-66. https://doi.org/10.1016/j.ypmed.2018.02.004

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the Medical Research Council guidance. Medical Research Council. Accessed on 2nd August 2020 from: https://mrc.ukri.org/documents/pdf/complex-interventions-guidance/

Curl, A., Kearns, A., Mason, P., Egan, M., Tannahill, C., & Ellaway, A. (2015). Physical and mental health outcomes following housing improvements: evidence from the GoWell study. *Journal of Epidemiology and Community Health*, *69*(1), 12-19. http://dx.doi.org/10.1136/jech-2014-204064

Department of Health and Social Care (2020, September 28). *New legal duty to self-isolate comes into force today.* Department of Health and Social Care Press Release. Accessed on 28th September 2020 from: https://www.gov.uk/government/news/new-legal-duty-to-self-isolate-comes-into-force-today

Dixon, D., & Johnston, M. (2010). The health behaviour change competency framework. NHS Scotland. Accessed on 22nd August 2020 from: http://www.knowledge.scot.nhs.uk/media/14232483/health%20behaviour%20change%20competency%20framework.pdf

Doll, R., Peto, R., Boreham, J., & Sutherland, I. (2004). Mortality in relation to smoking: 50 years' observations on male British doctors. *British Medical Journal, 328*(7455), 1519. https://doi.org/10.1136/bmj.38142.554479.AE

Donaldson, L. J., Kelley, E. T., Dhingra-Kumar, N., Kieny, M. P., & Sheikh, A. (2017). Medication without harm: WHO's third global patient safety challenge. *The Lancet*, 389(10080), 1680-1681. https://doi.org/10.1016/S0140-6736(17)31047-4

d'Errico, A., Punnett, L., Cifuentes, M., Boyer, J., Tessler, J., Gore, R., ... & Slatin, C. (2007). Hospital injury rates in relation to socioeconomic status and working

conditions. *Occupational and Environmental Medicine*, *64*(5), 325-333. http://dx.doi.org/10.1136/oem.2006.027839

Eccles, M. P., & Mittman, B. S. (2006). Welcome to implementation science. *Implementation Science*, *1*:1. https://doi.org/10.1186/1748-5908-1-1

Engel, G.L. (1980). The clinical application of the biopsychosocial model. *American Journal of Psychiatry*, 137(5), 535-544.

English, M. (2013). Designing a theory-informed, contextually appropriate intervention strategy to improve delivery of paediatric services in Kenyan hospitals. *Implementation Science*, 8(1), 39. https://doi.org/10.1186/1748-5908-8-39

Ferlie, E.B., & Shortell, S. M. (2001). Improving the quality of health care in the United Kingdom and the United States: a framework for change. *The Milbank Quarterly*, 79(2), 281-315. https://doi.org/10.1111/1468-0009.00206

Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Addison-Wesley.

Francis, J.J., & Presseau, J. (2019). *Healthcare practitioner behaviour*. In C. Llewellyn, S. Ayers, C McManus., S. Newman., K. Petrie., T.A. Revenson., J. Weinman & R. West [Eds]. Cambridge Handbook of Psychology, Health and Medicine (3rd ed.). Cambridge University Press.

Gardner, B., Whittington, C., McAteer, J., Eccles, M. P., & Michie, S. (2010). Using theory to synthesise evidence from behaviour change interventions: the example of audit and feedback. *Social science & Medicine*, *70*(10), 1618-1625. https://doi.org/10.1016/j.socscimed.2010.01.039

Garrett, P. W., Dickson, H. G., Young, L., & Whelan, A. K. (2008). "The Happy Migrant Effect": perceptions of negative experiences of healthcare by patients with little or no English: a

qualitative study across seven language groups. *BMJ Quality & Safety*, *17*(2), 101-103. https://doi.org/10.1136/qshc.2007.022426

Gast, A., & Mathes, T. (2019). Medication adherence influencing factors—an (updated) overview of systematic reviews. *Systematic Reviews*, *8*(1), 112. https://doi.org/10.1186/s13643-019-1014-8

Glanz, K., & Rimer, B.K. (2005). *Theory at a glance: A guide for health promotion practice (2nd edn).* National Cancer Institute, National Institutes of Health, Public Health Service.

Global Alliance for Chronic Diseases. (2013, November 26). Susan Michie Behaviour Change for GACD [Video file]. Retrieved on 2nd July 2020 from https://www.youtube.com/watch?v=XKwLplsPapc

Goodley, D., & Runswick-Cole, K. (2015). Critical disability studies and critical health psychology: Comrades in arms? In M. Murray. (Ed.). (2015). *Critical health psychology*. Macmillan International Higher Education.

Goodman, S., Sirriyeh, A., & McMahon, S. (2017). The evolving (re) categorisations of refugees throughout the "refugee/migrant crisis". *Journal of Community & Applied Social Psychology*, 27(2), 105-114. https://doi.org/10.1002/casp.2302

Grimshaw, J.M., Thomas, R.E., MacLennan, G….. & Donaldson, C. (2004). Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technology Assessment*, 8(6), iii-iv, 1-72. https://doi.org/10.3310/hta8060

Grol, R. (2001). Successes and Failures in the Implementation of Evidence-Based Guidelines for Clinical Practice. *Medical Care*, *39*(8), II46–II54. https://doi.org/10.1097/00005650-200108002-00003

Gruer, L., Hart, C. L., Gordon, D. S., & Watt, G. C. (2009). Effect of tobacco smoking on survival of men and women by social position: a 28 year cohort study. *British Medical Journal, 338*, b480. https://doi.org/10.1136/bmj.b480

Hagger, M.S., & Chatzisarantis, N.L. (2009). Integrating the theory of planned behaviour and self-determination theory in health behaviour: a meta-analysis. *British Journal of Health Psychology*, 14(2), 275-302. https://doi.org/10.1348/135910708x373959

Hallsworth, M., Chadborn, T., Sallis, A., Sanders, M., Berry, D., Greaves, F., ... & Davies, S. C. (2016). Provision of social norm feedback to high prescribers of antibiotics in general practice: a pragmatic national randomised controlled trial. *The Lancet*, 387(10029), 1743-1752. https://doi.org/10.1016/s0140-6736(16)00215-4

Hilton, C.E. & Johnston, L.H. (2017). Health psychology: It's not what you do, it's the way that you do it. *Health Psychology Open*, 4(2). https://doi.org/10.1177/2055102917714910

Hiscock, R., Judge, K., & Bauld, L. (2011). Social inequalities in quitting smoking: what factors mediate the relationship between socioeconomic position and smoking cessation? *Journal of Public Health*, 33, 39–47. https://doi.org/10.1093/pubmed/fdq097

Hiscock, R., Bauld, L., Amos, A., Fidler, J. A., & Munafò, M. (2012). Socioeconomic status and smoking: a review. *Annals of the New York Academy of Sciences*, *1248*(1), 107-123. https://doi.org/10.1111/j.1749-6632.2011.06202.x

House of lords: Science and technology select sub-committee. (2011). *Second report of session 2010–12: Behaviour change*. His Majesty's Stationery Office LTD. Accessed on 2nd July 2020 from: https://publications.parliament.uk/pa/ld201012/ldselect/ldsctech/179/179.pdf

House, J. S., Kessler, R. C., & Herzog, A. R. (1990). Age, socioeconomic status, and health. *The Milbank Quarterly*, 383-411. https://doi.org/10.2307/3350111

Huijg, J. M., Crone, M. R., Verheijden, M. W., van der Zouwe, N., Middelkoop, B. J., & Gebhardt, W. A. (2013). Factors influencing the adoption, implementation, and continuation of physical activity interventions in primary health care: a Delphi study. *BMC Family Practice*, 14(1), 142. https://doi.org/10.1186/1471-2296-14-142

Hynes, S. (2013). Austerity justice. *Journal of poverty and social justice*, 21 (1), 97-100. https://doi.org/10.1332/175982713X664489

Ivers, N. M., Sales, A., Colquhoun, H., Michie, S., Foy, R., Francis, J. J., & Grimshaw, J. M. (2014). No more 'business as usual' with audit and feedback interventions: towards an agenda for a reinvigorated intervention. *Implementation Science*, *9*(1), 14. https://doi.org/10.1186/1748-5908-9-14

Johnston, M. (1997). How health psychology makes a difference. *The Irish Journal of Psychology*, *18*(1), 4-12. https://doi.org/10.1080/03033910.1997.10558126

Johnston, M. (2016). What more can we learn from early learning theory? The contemporary relevance for behaviour change interventions. *British Journal of Health psychology*, 21(1): 1-10. https://doi.org/10.1111/bjhp.12165

Keyworth, C., Epton, T., Goldthorpe, J., Calam, R., & Armitage, C. J. (2020). Acceptability, reliability, and validity of a brief measure of capabilities, opportunities, and motivations ("COM-B"). *British Journal of Health Psychology*. (Online first) https://doi.org/10.1111/bjhp.12417

Kincheloe, J. (2005). On to the next level: continuing the conceptualization of the bricolage. *Qualitative Inquiry*, 11, 323–50. https://doi.org/10.1177/1077800405275056

Kok, G., Schaalma, H., Ruiter, R. A., Van Empelen, P., & Brug, J. (2004). Intervention mapping: protocol for applying health psychology theory to prevention programmes. *Journal of Health Psychology*, 9(1), 85-98. https://doi.org/10.1177/1359105304038379

Langley, G.L., Moen, R., Nolan, K.M., Nolan, T.W., Norman, C.L., & Provost, L.P. (2009) *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance* (2nd edition). Jossey-Bass Publishers.

Lau, A., Spark, S., Tomnay, J., Smith, M.T., Fairley, C.K., Guy, R.J., Donovan, B., & Hocking, J.S. (2016) Socio-demographic and structural barriers to being tested for chlamydia in general practice. *Medical Journal of Australia, 1*5, 204(3), 112. https://doi.org/10.5694/mjac15.00933

Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. Guilford Publications. https://doi.org/10.1111/fcsr.12276

Leventhal, H., Brissette, I., Leventhal, E.A., Cameron, L.D., & Leventhal, H. (2003) The common-sense model of self-regulation of health and illness. In L.D. Cameron & H. Leventhal (Eds.) *The Self-Regulation of Health and Illness Behaviour*, (pp.42-65). Routledge.

Loucks, E. B., Lynch, J. W., Pilote, L., Fuhrer, R., Almeida, N. D., Richard, H., ... & Benjamin, E. J. (2009). Life-course socioeconomic position and incidence of coronary heart disease: the Framingham Offspring Study. *American Journal of Epidemiology*, *169*(7), 829-836. https://doi.org/10.1093/aje/kwn403

Louwman, W. J., Aarts, M. J., Houterman, S., Van Lenthe, F. J., Coebergh, J. W. W., & Janssen-Heijnen, M. L. G. (2010). A 50% higher prevalence of life-shortening chronic conditions among cancer patients with low socioeconomic status. *British Journal of Cancer*, *103*(11), 1742-1748. https://doi.org/10.1038/sj.bjc.6605949

Manstead, A. S. (2018). The psychology of social class: How socioeconomic status impacts thought, feelings, and behaviour. *British Journal of Social Psychology*, *57*(2), 267-291. https://doi.org/10.1111/bjso.12251

Marmot, M., Allen, J., Goldblatt, P., Boyce, T., McNeish, D., & Grady, M. (2010). *Fair Society, Healthy Lives: The Marmot Review*. Accessed on 5th January 2020 from https://www.parliament.uk/globalassets/documents/fair-society-healthy-lives-full-report.pdf

Marmot, M., Allen, J., Boyce, T., Goldblatt, P., & Morrison, J. (2020). *Health Equity in England: The Marmot Review ten years on*. Institute of Health Equity. Accessed on 3rd July 2020 from: https://www.health.org.uk/sites/default/files/upload/publications/2020/Health%20Equity%20in%20England_The%20Marmot%20Review%2010%20Years%20On_full%20report.pdf

Martin-Smith, H.A., Okpo, E.A., and Bull, E.R. (2018). Exploring the psychosocial predictors of STI testing in university students. *BMC Public Health*, 18, 664. https://doi.org/10.1186/s12889-018-5587-2

McCleary, N., Duncan, E. M., Stewart, F., & Francis, J. J. (2013). Active ingredients are reported more often for pharmacologic than non-pharmacologic interventions: an illustrative review of reporting practices in titles and abstracts. *Trials*, *14*(1), 146. https://doi.org/10.1186/1745-6215-14-146

McGlynn, E. A., Asch, S. M., Adams, J., Keesey, J., Hicks, J., DeCristofaro, A., & Kerr, E. A. (2003). The quality of health care delivered to adults in the United States. *New England Journal of Medicine*, 348(26), 2635-2645. https://doi/org/10.1056/NEJMsa022615

Mensah Abrampah, N., Syed, S. B., Hirschhorn, L. R., Nambiar, B., Iqbal, U., Garcia-Elorrio, E., ... & Kelley, E. (2018). Quality improvement and emerging global health priorities. *International Journal for Quality in Health Care*, *30*(suppl_1), 5-9. https://doi.org/10.1093/intqhc/mzy007

Meyer, D., Leventhal, H., & Gutmann, M. (1985). Common-sense models of illness: The example of hypertension, *Health Psychology*, 4, 115-35. https://doi.org/10.1037//0278-6133.4.2.115

Michie S, Abraham C, Whittington C, McAteer J, & Gupta S. (2009). Effective Techniques in Healthy Eating and Physical Activity Interventions: A Meta-Regression. *Health Psychology*, 28, 690-701. https://doi.org/10.1037/a0016136

Michie, S., Atkins, L., & West, R. (2014) *The Behaviour Change Wheel: A Guide to Designing Interventions.* Silverback Publishing.

Michie S., Churchill S., & West R (2011) Identifying evidence-based competences required to deliver behavioural support for smoking cessation. *Annals of Behavioral Medicine*, 41(1), 59-70. https://doi.org/10.1007/s12160-010-9235-z

Michie, S., Hardeman, W., Fanshawe, T., Prevost, A. T., Taylor, L., & Kinmonth, A. L. (2008). Investigating theoretical explanations for behaviour change: The case study of ProActive. *Psychology and Health*, *23*(1), 25-39. https://doi.org/10.1080/08870440701670588

Michie, S., Jochelson, K., Markham, W. A., & Bridle, C. (2009). Low-income groups and behaviour change interventions: a review of intervention content, effectiveness and theoretical frameworks. *Journal of Epidemiology & Community Health*, *63*(8), 610-622. https://doi.org/10.1136/jech.2008.078725

Michie, S., Johnston, M., Francis, J., Hardeman, W., & Eccles, M. (2008). From theory to intervention: mapping theoretically derived behavioural determinants to behaviour change techniques. *Applied Psychology*, *57*(4), 660-680. https://doi.org/10.1111/j.1464-0597.2008.00341.x

Michie, S., & Prestwich, A. (2010). Are interventions theory-based? Development of a theory coding scheme. *Health Psychology*, *29*(1), 1. https://doi.org/10.1037/a0016939

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., ... & Wood, C. E. (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*, *46*(1), 81-95. http://dx.doi.org/10.1007/s12160-013-9486-6

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation Science*, *6*(1), 42. https://doi.org/10.1186/1748-5908-6-42

Michie, S. F., West, R., Campbell, R., Brown, J., & Gainforth, H. (2014). *ABC of behaviour change theories*. Silverback Publishing.

Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual causes of death in the United States, 2000. *Journal of the American Medical Association*, *291*(10), 1238-1245. https://doi.org/10.1001/jama.291.10.1238

Morris, Z. S., Wooding, S., & Grant, J. (2011). The answer is 17 years, what is the question: understanding time lags in translational research. *Journal of the Royal Society of Medicine*, 104(12), 510-520. https://doi.org/10.1258/jrsm.2011.110180

Murray, M. (2015). Introducing Critical Health Psychology. In M. Murray (Ed). *Critical health psychology* (pp.1-16). Macmillan International Higher Education.

Noar, S.M., & Zimmerman, R.S. (2005). Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Education Research*, 20, 275–290.

NHS England. (2014a). Patient safety alert, stage 3, directive: improving medication error incident reporting and learning. NHS England. Accessed on 1st August 2020 from https://www.england.nhs.uk/wp-content/uploads/2014/03/psa-sup-info-med-error.pdf.

NHS England. (2014b). The five year forward view. NHS England Accessed on 1st August 2020 from https://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf

Nuñez, D. E., Keller, C., & Ananian, C. D. (2009). A Review of the efficacy of the self-management model on health outcomes in community-residing older adults with arthritis. *Worldviews on Evidence-Based Nursing*, *6*(3), 130-148. https://doi.org/10.1111/j.1741-6787.2009.00157.x

O'Cathain, A., Croot, L., Sworn, K., Duncan, E., Rousseau, N., Turner, K., ... & Hoddinott, P. (2019). Taxonomy of approaches to developing interventions to improve health: a systematic methods overview. *Pilot and feasibility studies*, 5(1), 41. https://doi.org/10.1186/s40814-019-0425-6

Office for National Statistics. (2020). Health state life expectancies by national deprivation deciles, England: 2016 to 2018. Office for National Statistics. Accessed on 31st July 2020 from https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthinequalities/bulletins/healthstatelifeexpectanciesbyindexofmultipledeprivationimd/2016to2018

Ogden, J. (2016). Celebrating variability and a call to limit systematisation: the example of the Behaviour Change Technique Taxonomy and the Behaviour Change Wheel. *Health Psychology Review*, *10*(3), 245-250. https://doi.org/10.1080/17437199.2016.1190291

Patel, J. A., Nielsen, F. B. H., Badiani, A. A., Assi, S., Unadkat, V. A., Patel, B., ... & Wardle, H. (2020). Poverty, inequality and COVID-19: the forgotten vulnerable. *Public Health*, *183*, 110. https://doi/org/10.1016/j.puhe.2020.05.006

Pearson, E.J., Byrne-Davis, L., Bull, E.R., Hart, J. (2018). Behavior change techniques in health professional training: developing a coding tool. *Translational Behavioural Medicine*, 10(1), 96-102 https://doi.org/10.1093/tbm/iby125c

Peters, G. J. Y., Ruiter, R. A., & Kok, G. (2013). Threatening communication: a critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review*, *7*(sup1), S8-S31. https://doi.org/10.1080/17437199.2012.703527

Peters, G. J. Y., De Bruin, M., & Crutzen, R. (2015). Everything should be as simple as possible, but no simpler: towards a protocol for accumulating evidence regarding the active content of health behaviour change interventions. *Health Psychology Review*, 9(1), 1-14. https://doi.org/10.1080/17437199.2013.848409

Popay, J., Whitehead, M., & Hunter, D.J. (2010) Injustice is killing people on a large scale – but what is to be done about it? *Journal of Public Health*, 32, 2, 148–9. https://doi.org/10.1093/pubmed/fdq029

Popper, K. (1963). *Conjectures and Refutations*, Routledge and Kegan Paul. Reprinted in Theodore Schick (ed., 2000). *Readings in the Philosophy of Science*, Mayfield Publishing Company.

Porter, D. (1999) Health, civilization and the state: A history of public health from ancient to modern times. Routledge.

Presseau, J., McCleary, N., Lorencatto, F., Patey, A. M., Grimshaw, J. M., & Francis, J. J. (2019). Action, actor, context, target, time (AACTT): A framework for specifying behaviour. *Implementation Science*, 14(1), 102. https://doi.org/10.1186/s13012-019-0951-x

Prestwich, A., Kenworthy, J., & Conner, M. (2017). *Health behavior change: Theories, methods and interventions*. Routledge. https://doi.org/10.4324/9781315527215

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51(3), 390. https://doi.org/10.1037/0022-006X.51.3.390

Public Health England (2015). *Improving health literacy to reduce health inequalities*. Public Health England. Accessed on 15th September 2020 from: https://www.gov.uk/government/publications/local-action-on-health-inequalities-improving-health-literacy

Quinn, F., Chater, A., & Morrison, V. (2020). An oral history of health psychology in the UK. *British Journal of Health Psychology*, (online first) https://doi.org/10.1111/bjhp.12418

Riley, J.C. (2015). *Rising life expectancy: A global history*. Cambridge University Press.

Robbins, J. M., Vaccarino, V., Zhang, H., & Kasl, S. V. (2005). Socioeconomic status and diagnosed diabetes incidence. *Diabetes research and clinical practice*, *68*(3), 230-236. https://doi.org/10.1016/j.diabres.2004.09.007

Rosenstock, I.M. (1974). Historical origins of the health belief model. *Health Education Monographs*, *2*(4), 328-335. https://doi.org/10.1177/109019817400200403

Sallis, A., Harper, H., & Sanders, M. (2018). Effect of persuasive messages on National Health Service Organ Donor Registrations: a pragmatic quasi-randomised controlled trial with one million UK road taxpayers. *Trials,* 19(1), 513. https://doi.org/10.1186/s13063-018-2855-5

Saydah, S. H., Imperatore, G., & Beckles, G. L. (2013). Socioeconomic status and mortality: contribution of health care access and psychological distress among US adults with diagnosed diabetes. *Diabetes Care*, *36*(1), 49-55. https://doi.org/10.2337/dc11-1864

Schulz, K. F., Altman, D. G., Moher, D., & Consort Group. (2010). CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. *Trials*, 11(1), 32. https://doi.org/10.1186/1741-7015-8-18

Schwarzer, R. (1999). Self-regulatory processes in the adoption and maintenance of health behaviors. *Journal of Health Psychology*, 4(2), 115-127. https://doi.org/10.1177/135910539900400208

Segerstrom, S.C., & Miller, G.E. (2004). Psychological stress and the human immune system: a meta-analytic study of 30 years of inquiry. *Psychological Bulletin*, *130*(4), 601. https://doi.org/10.1037/0033-2909.130.4.601

Shelton, J.D. (2013). The 6 domains of behavior change: the missing health system building block. *Global Health Science and Practice, 1(2),* 137-140. https://doi.org/10.9745/GHSP-D-13-00083

Skinner, B. F. (1953). *Science and human behavior*. Macmillan.

Sneddon, J., Afriyie, D., Sefah, I., Cockburn, A., Kerr, F., Byrne-Davis, L., & Cameron, E. (2020). Developing a Sustainable Antimicrobial Stewardship (AMS) Programme in Ghana: Replicating the Scottish Triad Model of Information, Education and Quality Improvement. *Antibiotics*, 9(10), E636. https://doi.org/10.3390/antibiotics9100636

Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review, 8(1):* 1-7. https://doi.org/10.1080/17437199.2013.869710

South, J., Woodward, J., & Lowcock, D. (2007). New beginnings: stakeholder perspectives on the role of health trainers. *The journal of the Royal Society for the Promotion of Health*, *127*(5), 224-230. https://doi.org/10.1177/1466424007081791

Stam. H.J. (2015). A critical history of health psychology and its relationship to biomedicine. In M. Murray (Ed). *Critical health psychology* (pp.19-35). Macmillan International Higher Education.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review,* 8(3), 220-247. https://doi.org/10.1207/s15327957pspr0803_1

Sung, N. S., Crowley Jr, W. F., Genel, M., Salber, P., Sandy, L., Sherwood, L. M., ... & Larson, E. L. (2003). Central challenges facing the national clinical research enterprise. *Journal of the American Medical Association*, 289(10), 1278-1287. https://doi.org/10.1001/jama.289.10.1278

Szaflarski & Vaughn, (2015). Deconstructing and addressing health disparities to build health equity. In Murray, M. (Ed.). *Critical health psychology* (pp.87-108). Macmillan International Higher Education.

Taylor, S. E., Repetti, R. L., & Seeman, T. (1997). Health psychology: what is an unhealthy environment and how does it get under the skin? *Annual Review of Psychology*, 48(1), 411-447. https://doi.org/10.1146/annurev.psych.48.1.411

Teng, Y., & Mak, W. W. (2011). The role of planning and self-efficacy in condom use among men who have sex with men: An application of the Health Action Process Approach model. *Health Psychology*, *30*(1), 119. https://doi.org/10.1037/a0022023

The Scottish Government (2008). Equally well: Report of the ministerial task force on health inequalities. Scottish Government. Accessed on 14th June 2020 from: https://www.gov.scot/binaries/content/documents/govscot/publications/corporate-report/2008/06/equally-well-report-ministerial-task-force-health-inequalities/documents/0062206-pdf/0062206-pdf/govscot%3Adocument/0062206.pdf

The Scottish Government (2012). Chief executive letter 1: Health promoting health service: Action in hospital settings. Scottish Government. Accessed on 14th June 2020 from: https://www.sehd.scot.nhs.uk/mels/cel2012_01.pdf

Todd, J., & Mullan, B. (2013). The role of self-regulation in predicting sleep hygiene in university students. *Psychology, Health & Medicine*, *18*(3), 275-288. https://doi.org/10.1080/13548506.2012.701756

United Nations (2015). The millennium development goals report. United Nations. Retrieved on 2nd August 2020 from: https://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf

United Nations Department of Economic and Social Affairs (2019). World population prospects 2019: highlights. United Nations. Retrieved on 2nd August 2020 from: https://population.un.org/wpp/Publications/Files/WPP2019_10KeyFindings.pdf

Van Der Veer, S., Ercia, A., Caskey, F. J., Farrington , K., Jury, F., Rees, M., Whitlock , T., & Knowles, S. (In press). Developing an intervention to implement electronic patient-reported outcomes in renal services in the UK. *Studies in Health Technology and Informatics.*

Wanless, D. (2002). Securing our Future Health: Taking a Long-Term View. HM Treasury, accessed on 22nd August 2020 from: https://www.yearofcare.co.uk/sites/default/files/images/Wanless.pdf

Ward, E., Jemal, A., Cokkinides, V., Singh, G. K., Cardinez, C., Ghafoor, A., & Thun, M. (2004). Cancer disparities by race/ethnicity and socioeconomic status. *CA: A Cancer Journal for Clinicians*, *54*(2), 78-93. https://doi.org/10.3322/canjclin.54.2.78

Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, *132*(2), 249. https://doi.org/10.1037/0033-2909.132.2.249

West, J. C., Peasley-Miklus, C., Graham, A. L., Mays, D., Mermelstein, R., Higgins, S. T., & Villanti, A. C. (2020). Impact of alcohol and drug use on smoking and cessation in socioeconomically disadvantaged young adults. *Addictive Behaviors*, 106486. https://doi.org/10.1016/j.addbeh.2020.106486

White, M., Adams, J., & Heywood, P. (2009). How and why do interventions that increase health overall widen inequalities within populations? In S.J. Babones (Ed). *Social inequality and public health*, (*65*-82). Policy Press.

Whitley, E., Batty, G. D., Hunt, K., Popham, F., & Benzeval, M. (2014). The role of health behaviours across the life course in the socioeconomic patterning of all-cause mortality: the west of Scotland twenty-07 prospective cohort study. *Annals of Behavioral Medicine*, *47*(2), 148-157. https://doi.org/10.1007/s12160-013-9539-x

Wilkinson, R., and Pickett, K. (2019). The inner level: How more equal societies reduce stress, restore sanity and improve everyone's well-being. Penguin Books.

Wilkinson, R., and Pickett, K. (2009). The Spirit Level: Why Equality is Better for Everyone. Penguin Books.

Woolf, S.H. (2006, September 16) Unhealthy medicine: All breakthrough, no follow through. *Washington Post*, pp. 1-5.

World Health Organization (2013). WHO statistics show narrowing health gap between countries with best and worst health status. Retrieved on 2nd August 2020 from: https://www.who.int/mediacentre/news/releases/2013/world_health_statistics_20130515/en/

World Health Organization (2018). WHO framework on integrated people-centred health services. Retrieved on 2nd August 2020 from: https://www.who.int/servicedeliverysafety/areas/people-centred-care/en/

Appendix 1: The Behaviour Change Technique Taxonomy (v1)

Extract from Michie et al. 2013 to summarise the 93 BCTs labelled and defined within the BCTT.

BCT Taxonomy (v1): 93 hierarchically-clustered techniques

Page	Grouping and BCTs
1	**1. Goals and planning**
	1.1. Goal setting (behavior) 1.2. Problem solving 1.3. Goal setting (outcome) 1.4. Action planning 1.5. Review behavior goal(s) 1.6. Discrepancy between current behavior and goal 1.7. Review outcome goal(s) 1.8. Behavioral contract 1.9. Commitment
3	**2. Feedback and monitoring**
	2.1. Monitoring of behavior by others without feedback 2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 2.4. Self-monitoring of outcome(s) of behaviour 2.5. Monitoring of outcome(s) of behavior without feedback 2.6. Biofeedback 2.7. Feedback on outcome(s) of behavior
5	**3. Social support**
	3.1. Social support (unspecified) 3.2. Social support (practical) 3.3. Social support (emotional)
6	**4. Shaping knowledge**
	4.1. Instruction on how to perform the behavior 4.2. Information about Antecedents 4.3. Re-attribution 4.4. Behavioral experiments
7	**5. Natural consequences**
	5.1. Information about health consequences 5.2. Salience of consequences 5.3. Information about social and environmental consequences 5.4. Monitoring of emotional consequences 5.5. Anticipated regret 5.6. Information about emotional consequences
8	**6. Comparison of behaviour**
	6.1. Demonstration of the behavior 6.2. Social comparison 6.3. Information about others' approval
9	**7. Associations**
	7.1. Prompts/cues 7.2. Cue signalling reward 7.3. Reduce prompts/cues 7.4. Remove access to the reward 7.5. Remove aversive stimulus 7.6. Satiation 7.7. Exposure 7.8. Associative learning
10	**8. Repetition and substitution**
	8.1. Behavioral practice/rehearsal 8.2. Behavior substitution 8.3. Habit formation 8.4. Habit reversal 8.5. Overcorrection 8.6. Generalisation of target behavior 8.7. Graded tasks
11	**9. Comparison of outcomes**
	9.1. Credible source 9.2. Pros and cons 9.3. Comparative imagining of future outcomes
12	**10. Reward and threat**
	10.1. Material incentive (behavior) 10.2. Material reward (behavior) 10.3. Non-specific reward 10.4. Social reward 10.5. Social incentive 10.6. Non-specific incentive 10.7. Self-incentive 10.8. Incentive (outcome) 10.9. Self-reward 10.10. Reward (outcome) 10.11. Future punishment
15	**11. Regulation**
	11.1. Pharmacological support 11.2. Reduce negative emotions 11.3. Conserving mental resources 11.4. Paradoxical instructions
16	**12. Antecedents**
	12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.3. Avoidance/reducing exposure to cues for the behavior 12.4. Distraction 12.5. Adding objects to the environment 12.6. Body changes
17	**13. Identity**
	13.1. Identification of self as role model 13.2. Framing/reframing 13.3. Incompatible beliefs 13.4. Valued self-identify 13.5. Identity associated with changed behavior
18	**14. Scheduled consequences**
	14.1. Behavior cost 14.2. Punishment 14.3. Remove reward 14.4. Reward approximation 14.5. Rewarding completion 14.6. Situation-specific reward 14.7. Reward incompatible behavior 14.8. Reward alternative behavior 14.9. Reduce reward frequency 14.10. Remove punishment
19	**15. Self-belief**
	15.1. Verbal persuasion about capability 15.2. Mental rehearsal of successful performance 15.3. Focus on past success 15.4. Self-talk
19	**16. Covert learning**
	16.1. Imaginary punishment 16.2. Imaginary reward 16.3. Vicarious consequences

Appendix 2: Table of thesis research impact

Research impact can be defined as "*the demonstrable contribution that excellent research makes to society and the economy*" (UK Research and Innovation, 2019). Such outcomes have been seen as increasingly important in the past decade, leading to major changes in how research is funded and monitored. In UK Research Council-funded studies, researchers are asked to feed back annually on 16 research outputs and outcomes (UK Research Council, 2019). The table below uses these indicators to detail examples of the impact of the research presented in this thesis.

Project	**Indicator of impact**
Project 1: Health Behaviour Change in Low Income Groups **Publications 1 & 2**	**Publications** • Publication 1 was published in BMJ Open in 2014 (Impact factor 2.48). • As of August 2020, publication 1 has been downloaded 14557 times and cited in other academic articles 82 times giving a field citation ratio of 17. • Citations include a definitive health behaviour change textbook (Prestwich et al. 2017). • The newer publication 2 was published in the International Journal of Behavioural Medicine in 2018 (IF 2.01) and has 18 citations to date. • Both publications have an altmetric attention score of 50 putting them in the top 5% of research outputs scored by Altmetric. • Findings were presented at national and international conferences to colleagues in the fields of health psychology and public health.

	Collaborations and Partnerships • Dissemination of publication 1 at a European conference led to a collaboration two Netherlands-based statisticians to produce the novel data included in publication 2. **Influence on Policy, Practice, Patients and the Public** • Publication 1 cited by Public Health England in the health inequalities policy guidance document *Improving health literacy to reduce health inequalities* (Public Health England, 2015). • Publication 1 cited by social epidemiologist and political activist Professor Richard Wilkinson in a talk to an international audience of policy makers and public health colleagues in 2018 as evidence indicating the need for more effective interventions to reduce health inequalities. • Publication 2's findings used by the NHS Grampian Public Health Directorate to plan their community health inequalities programmes in their '2020 Vision'.
Project 2: Sexual Health in University Students **Publication 3**	**Publications** • Publication 3 was published in BMC Public Health in 2018 (IF 2.69) and has five citations to-date. • Findings have been presented at national conferences to colleagues in the fields of health psychology and public health. **Influence on Policy, Practice, Patients and the Public**

	• The findings and recommendations of publication 3 were used by NHS Grampian's health protection team to direct resources and guide the development of targeted health promotion campaigns for local university populations.
Project 3: Bump Start intervention **Publication 4**	**Publications** • Publication 4 was published in the practice-focussed journal British Journal of Midwifery in 2017 (IF 0.32) and had an altmetric attention score of 10. • Findings have been presented at national conferences to colleagues in the fields of health psychology and public health. **Engagement Activities** • The pilot group participants who wished to help raise awareness of the issue of healthy living in pregnancy, engage future participants in the intervention and help attract future funding. We produced this short video of their testimonies which was shown to health leaders to help secure future funding https://youtu.be/_-TJW7mer3k **Medical Products, Interventions and Clinical Trials** • The Bump Start antenatal behaviour change intervention arose from this work **Influence on Policy, Practice, Patients and the Public**

	• Following the initial pilot, NHS Grampian approved the programme to be rolled out in other areas of the region and evaluated further. • The Bump Start intervention was used by NHS Health Scotland as a case study example of successful antenatal interventions for women with a high BMI. **Further Funding** • We were able to secure further funding from NHS Grampian to backfill staff to deliver the programme going forward.
Project 4: Helping People Change for Health intervention **Publication 5**	**Publications** • Publication 5 was published in Health and Social Care in the Community in 2020 (IF 2.05) and had an altmetric attention score of 25. • Findings were presented at national health psychology and public health conferences. **Medical Products, Interventions and Clinical Trials** • The Helping People Change for Health training intervention arose from this work. **Influence on Policy, Practice, Patients and the Public** • To date, over 200 health and social care practitioners have taken part in the training intervention. These staff collectively serve a population of 500,000 in the NHS Grampian region including some of

	the most deprived communities in the UK. Participants shared via personal communication that taking part in the course acted as a turning point in their career, transforming their health promotion practice. • Following the initial pilot, NHS Grampian approved the programme to be rolled out across the region and evaluated further. • To date, the translational video resources have over 7000 views on You Tube https://www.youtube.com/channel/UC6SoN10uF98dAWXaDEOj6Wg **Awards and recognition** • Project nominated for an NHS Grampian Recognition Award for Teams and Staff (GRAFTAS) 'Innovation' award in 2016.
Project 5: BCTs for health professional educators **Publication 6**	**Publications** • Publication 6 was published in Translational Behavioral Medicine (IF 2.52) and had an altmetric attention score of 50, putting it in the top 5% of research outputs scored by Altmetric. • Findings were presented at national and international health psychology and behavioural medicine conferences. **Medical Products, Interventions and Clinical Trials**

	• A freely available translational tool called Cards for Change arose from this work https://www.mcrimpsci.org/change-exchange/cards-for-change/ **Influence on Policy, Practice, Patients and the Public** • 1000 packs of Cards for Change were disseminated to educators, policy makers, researchers and health practitioners who requested a pack for practitioner, education or research work. • Analyses of our evaluation data suggest the cards have been used by a range of multi-disciplinary colleagues for many purposes. Some examples include in the field of medical education in teaching sessions with trainee doctors, psychology training to teach psychologists to design theory-based training interventions and in smoking cessation groups to help service users identify ways to overcome barriers to change. The cards have been used by health policy makers to develop implementation activities, by the US government to develop cyber security interventions and by pharmacists to develop antibiotic resistance training for use in Sub-Saharan Africa. **Engagement Activities** • The project's findings and the Cards for Change were shared in an antimicrobial resistance workshop with 40 global health scientists, epidemiologists and pharmacists in the UK in 2019 and in an international behavioural science workshop in Rwanda in 2018. • The Cards for Change were used to train 30 international behaviour change specialists in University College London's Centre for Behaviour Change Summer School in 2019.

	Awards and recognition • Professors Lucie Byrne-Davis, Jo Hart and I were delighted to win the 2020 British Psychological Society Innovation in Practice Award for the Cards for Change. https://thepsychologist.bps.org.uk/volume-33/october-2020/practice-board-awards
Project 6: Teams Together intervention **Publications 7 and 8**	**Publications** • Publication 7 was published in the International Journal for Quality in Health Care in 2018 (IF 1.96) and had an altmetric attention score of 9. • Publication 8 was published in BMJ Health Services Research in 2019 (IF 1.93) and had an altmetric score of 13. • Findings from the project were disseminated at a national behavioural medicine conference and an international health psychology conference. **Medical Products, Interventions and Clinical Trials** • The Teams Together intervention, translational e-learning materials, workshop materials and two animations were produced as a result of this project. **Influence on Policy, Practice, Patients and the Public**

	• Over 80 health and social care professionals from four NHS trusts took part in co-developing the Teams Together interventions in the research. These staff were improving healthcare quality for a collective North West England population of over 7 million people. • 26 organisational development specialists from Manchester University NHS Foundation trust were trained to use the Teams Together approach with clinical teams (train the trainer model) • In other workshops and training events, the animations have been shared with trainee psychologists, infection control specialists and many other health and social care practitioners over the past three years in the UK and internationally, to help them co-develop theory-based interventions to promote change https://www.mcrimpsci.org/organisational-change-elearning/ **Engagement Activities** • A podcast broadcast in 2018 for leaders of Manchester's health and social care devolution https://www.mui.manchester.ac.uk/devo-manc/research/devo-matters-podcasts/ • I was invited to give workshops to health services researchers at the BPS Division of Health Psychology Scotland and the National University of Ireland Galway about the approach. **Further Funding** • Following this project NHS Health Education England have developed new posts for nine trainee health psychologists to be based in NHS trusts in North West England to use the Teams Together intervention and other behavioural science approaches to help strengthen healthcare from 2021.

Project 7: Strengthening medication safety in Mozambique **Publication 9**	**Publications** • Publication 9 was published in Globalization and Health in 2017 (IF 2.65) and had an altmetric attention score of 35. To date it has been accessed 6763 times and cited 12 times. • The project also featured as a case study in Byrne-Davis et al. (2017) • Findings from the project were disseminated at an international global health conference and an international health psychology conference. **Medical Products, Interventions and Clinical Trials** • An enhanced medication safety training intervention resulted from this work. **Influence on Policy, Practice, Patients and the Public** • The enhanced medication safety training intervention was delivered to 60 nurses and auxiliary nurses in Beira Central Hospital, Mozambique and has since been implemented as part of routine nurse education in Ipswich Hospital, UK. • Evaluation of the wider project suggested that the non-psychologist health professionals planned to use concepts like behavioural specification, interactive BCTs and behavioural evaluation in their routine practice following the end of the partnership project. • In 2016 this project was amongst four with health psychologists contributing to health partnerships; in 2018 the Change Exchange were then invited to contribute to 10 further partnership projects.