- The behaviour change wheel: A new method for characterising and designing behaviour change interventions
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Background

- Improving the implementation of evidence-based practice and public health depends on behaviour change.
- Thus, behaviour change interventions are fundamental to the effective practice of clinical medicine and public health, as indeed they are to many pressing issues facing society. 'Behaviour change interventions' can be defined as coordinated sets of activities designed to change specified behaviour patterns. In general, these behaviour patterns are measured in terms of the prevalence or incidence of particular behaviours in specified populations (e.g., delivery of smoking cessation advice by general practitioners). Interventions are used to promote uptake and optimal us of effective clinical services, and to promote healthy lifestyles.

- Evidence of intervention effectiveness serves to guide health providers to implement what is considered to be best practice. While there are many examples of successful interventions, there are also countless examples of ones that it was hoped would be effective but were not .
- To improve this situation, and to improve the translation of research into practice, we need to develop the science and technology of behaviour change and make this useful to those designing interventions and planning policy.

- The process of designing behaviour change interventions usually involves first of all determining the broad approach that will be adopted and then working on the specifics of the intervention design. For example, when attempting to reduce excessive antibiotic prescribing one may decide that an educational intervention is the appropriate approach. Alternatively, one may seek to incentivise appropriate prescribing or in some way penalise inappropriate prescribing. Once one has done this, one would decide on the specific intervention components.

- In order to identify the type or types of intervention that are likely to be effective, it is important to canvass the full range of options available and use a rational system for selecting from among them.
- This requires a system for characterising interventions that covers all possible intervention types together with a system for matching these features to the behavioural target, the target population, and the context in which the intervention will be delivered. This should be underpinned by a model of behaviour and the factors that influence it.

- Interventions are commonly designed without evidence of having gone through this kind of process, with no formal analysis of either the target behaviour or the theoretically predicted mechanisms of action. They are based on implicit commonsense models of behaviour [6].
- Even when one or more models or theories are chosen to guide the intervention, they do not cover the full range of possible influences so exclude potentially important variables.
- For example, the often used Theory of Planned Behaviour and Health Belief Model do not address the important roles of impulsivity, habit, self-control, associative learning, and emotional processing

- In addition, often no analysis is undertaken to guide the choice of theories.
- Useful guidance from the UK Medical Research Council for developing and evaluating complex interventions advocates drawing on theory in intervention design but does not specify how to select and apply theory.
- There exists a plethora of frameworks for classifying behaviour change interventions but an informal analysis suggests that none are comprehensive and conceptually coherent.

- One such distinction is between population-level and individual level interventions.
- Indeed, the NHS Stop Smoking Services might be considered a typical case of individual- level interventions, but they reach more than 600,000 smokers each year.

- these are empirical questions and there is already evidence that characterising interventions by behaviour change techniques (BCTs) can be helpful in understanding which interventions are more or less effective.

- To achieve its goal, a framework for characterising
- interventions should be comprehensive: it should apply to every intervention that has been or could be developed. Failure to do this limits the scope of the system to offer options for intervention designers that may be effective.
- Second, the framework needs to be coherent in that
- its categories are all exemplars of the same type of entity and have a broadly similar level of specificity. Thus, categories should be from a super-ordinate entity(e.g., function of the intervention), and the framework should not include some categories that are very broad and others very specific.
- In addition, the categories should be able to be linked to specific behaviour change mechanisms that in turn can be linked to the model of behaviour.

- Other criteria can be used to evaluate its applicability, e.g., reliability, ease of use, ease of communication, ability to explain outcomes, usefulness for generating new interventions, and ability to predict effectiveness of interventions

this paper aims to

- 1. Review existing frameworks of behavioural interventions to establish how far each meets the criteria of usefulness, and to identify a comprehensive list of intervention descriptors at a level of generality that is usable by intervention designers and policy makers.
- 2. Use this list to construct a framework of behaviour change interventions that meets the usefulness criteria listed above.
- 3. Establish the reliability with which the new framework can be used to characterise interventions in two public health domains.

methods

- Prior to reviewing the literature on intervention frameworks, we needed to establish a set of criteria for evaluating their usefulness. Following this, our method involved three steps:
- a systematic literature review and evaluation of existing behaviour change intervention frameworks,
- development of a new framework, and
- a test of the reliability of the new framework.

Establishing criteria of usefulness

- 1. Comprehensive coverage – the framework should apply to every intervention that has been or could be Developed
- 2. Coherence, i.e., categories are all exemplars of the same type and specificity of entity.
- 3. Links to an overarching model of behaviour.

- We use the term ‘model’ here in the sense defined in the Oxford English Dictionary: ‘a hypothetical description of a complex entity or process.’ For the overarching model of behaviour, we started with motivation,defined as: brain processes that energize and direct behaviour)
- Our next step was to consider the minimum number of additional factors needed to account for whether change in the behavioural target would occur, given sufficient motivation. We drew on two sources representing very different traditions: a US consensus meeting of behavioural theorists in 1991, and a principle of US criminal law dating back many centuries.

- In this ‘behaviour system,’ capability, opportunity, and motivation interact to generate behaviour (the ‘COM-B’ system).
- Capability is defined as the individual’s psychological and physical capacity to engage in the activity concerned. It includes having the necessary knowledge and skills.
- Motivation is defined as all those brain processes that energize and direct behaviour, not just goals and conscious decision-making. It includes habitual processes, emotional responding, as well as analytical decision-making.
- Opportunity is defined as all the factors that lie outside the individual that make the behaviour possible or prompt it.

For example, opportunity can influence motivation as can capability; enacting a behaviour can alter capability, motivation, and opportunity.

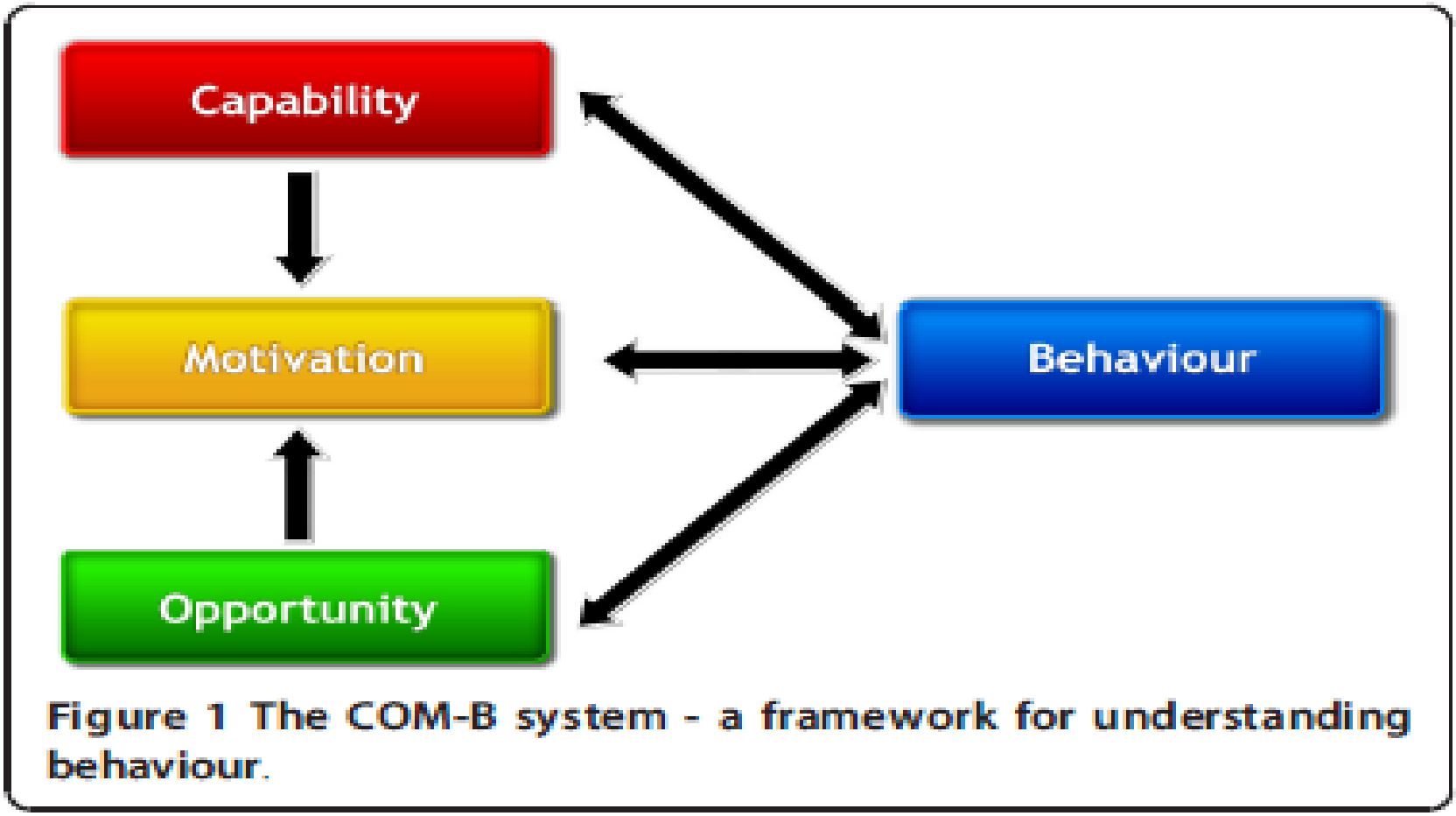


Figure 1 The COM-B system - a framework for understanding behaviour.

Systematic literature review of current frameworks

- We used the following search terms to identify scholarly articles containing frameworks of behaviour change interventions: Topic = (taxonomy or framework or classification) AND Topic = ('behaviour change' or 'behavior change') AND Topic = (prevention OR intervention OR promotion OR treatment OR program OR programme OR policy OR law OR politics OR regulation OR government OR institute OR legislation).
- Searches of Web of Science (Science and Social Science
- databases), Pubmed. and PsycInfo were supplemented by
- consulting with eight international experts in behaviour
- change, drawn from the disciplines of psychology, health
- promotion, epidemiology, public health, and anthropology

- Documents were included if: they described a framework of behaviour change interventions (not specific behaviour change techniques);
- 1-the framework was specified in enough detail to allow their key features to be discerned;
- 2- they were written in English.

A subset was then selected using the inclusion criteria for full review. The nature of the topic meant that this review could not be undertaken using the PRISMA guidelines

Develop a new framework

- The new framework was developed by tabulating the full set of intervention categories that had been identified and establishing links between intervention characteristics and components of the COM-B system that may need to be changed. The definitions and conceptualisation of the intervention categories were refined through discussion and by consulting the American Psychological Association's Dictionary of Psychology and the Oxford English Dictionary. The resulting framework was then compared with the existing ones in terms of the criteria of usefulness

Test the reliability of the framework

- The framework was used independently by RW and SM to classify the 24 components of the 2010 English government tobacco control strategy ,and the 21 components of the 2006 NICE obesity guidance.
- The level of inter-rater agreement was computed and any differences resolved through discussion. The areas of tobacco control and obesity reduction were chosen because these are among the most important in public health and ones where health professional behaviour has consistently been found to fall short of that recommended by evidence-based guidelines

Results

- Systematic literature review of existing frameworks:
- From the systematic literature search, 1,267 articles were identified from the electronic databases, eight of which met our inclusion criteria. The expert consultations produced a further 17 articles, 11 of which met the inclusion criteria resulting in a total of 19 articles describing 19 frameworks.

Development of a new framework

- Given that policies can only influence behaviour through the interventions that they enable or support, it seemed appropriate to place interventions between these and behaviour. The most parsimonious way of doing this seemed to be to represent the whole classification system in terms of a 'behaviour change wheel' (BCW) with three layers as shown in Figure 2. This is not a linear model in that components within the behaviour system interact with each other as do the functions within the intervention layer and the categories within the policy layer. Having established the structure of the new framework, the next step was to link the components of the behaviour system to the intervention functions and to link these to policy categories using the approach described in the Methods section. This led to a framework that met the third criterion of linkage with an overarching model of behaviour change.(table 2, 3)

Table 2 Links between the components of the 'COM-B' model of behaviour and the intervention functions

Model of behaviour: sources	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
C-Ph					√				√
C-Ps	√				√				√
M-Re	√	√	√	√					
M-Au		√	√	√			√	√	√
O-Ph						√	√		√
O-So						√	√		√

1. Physical capability can be achieved through physical skill development which is the focus of training or potentially through enabling interventions such as medication, surgery or prostheses.

2. Psychological capability can be achieved through imparting knowledge or understanding, training emotional, cognitive and/or behavioural skills or through enabling interventions such as medication.

3. Reflective motivation can be achieved through increasing knowledge and understanding, eliciting positive (or negative) feelings about behavioural target.

4. Automatic motivation can be achieved through associative learning that elicit positive (or negative) feelings and impulses and counter-impulses relating to the behavioural target, imitative learning, habit formation or direct influences on automatic motivational processes (*e.g.*, via medication).

Table 3 Links between policy categories and intervention functions

	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
Communication/ Marketing	√	√	√	√				√	
Guidelines	√	√	√	√	√	√	√		√
Fiscal			√	√	√		√		√
Regulation	√	√	√	√	√	√	√		√
Legislation	√	√	√	√	√	√	√		√
Environmental/social planning							√		√
Service Provision	√	√	√	√	√			√	√

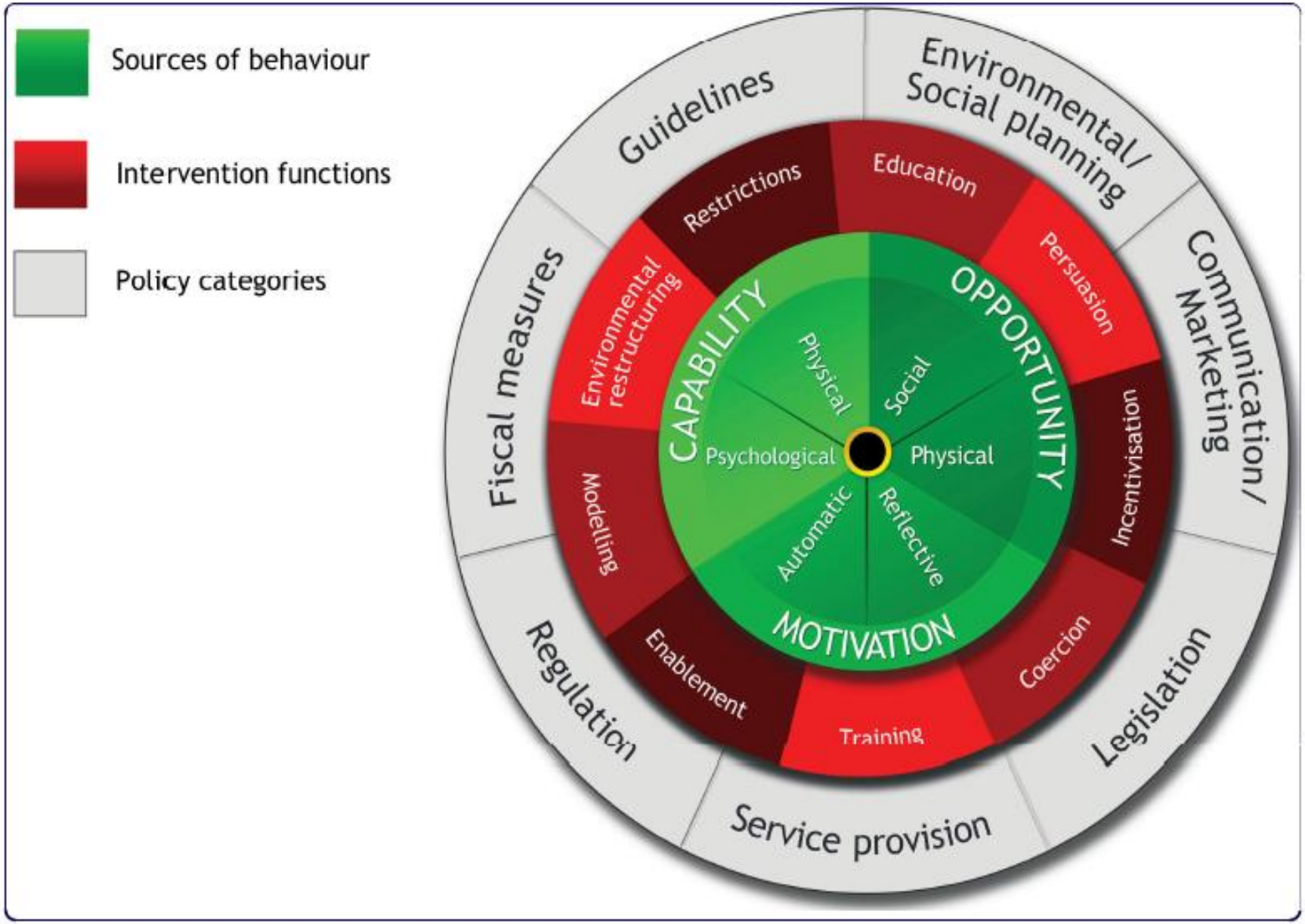
Testing the reliability of the new framework

- The initial coding of the intervention functions and policy categories of the 2010 English Tobacco Control Strategy was achieved with an inter-rater agreement of 88%.
- The inter-rater agreement for the NICE Obesity Guidance was 79%. Differences were readily resolved through discussion .
- The percentage agreement between the identified components and the 'gold standard' was 85% for the implementation lead for the 2010 English government tobacco control strategy in the Department of Health and 75% for the tobacco researcher.

Table 1 Definitions of interventions and policies

Interventions	Definition	Examples
Education	Increasing knowledge or understanding	Providing information to promote healthy eating
Persuasion	Using communication to induce positive or negative feelings or stimulate action	Using imagery to motivate increases in physical activity
Incentivisation	Creating expectation of reward	Using prize draws to induce attempts to stop smoking
Coercion	Creating expectation of punishment or cost	Raising the financial cost to reduce excessive alcohol consumption
Training	Imparting skills	Advanced driver training to increase safe driving
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)	Prohibiting sales of solvents to people under 18 to reduce use for intoxication
Environmental restructuring	Changing the physical or social context	Providing on-screen prompts for GPs to ask about smoking behaviour
Modelling	Providing an example for people to aspire to or imitate	Using TV drama scenes involving safe-sex practices to increase condom use
Enablement	Increasing means/reducing barriers to increase capability or opportunity[1]	Behavioural support for smoking cessation, medication for cognitive deficits, surgery to reduce obesity, prostheses to promote physical activity
Policies		
Communication/ marketing	Using print, electronic, telephonic or broadcast media	Conducting mass media campaigns
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision	Producing and disseminating treatment protocols
Fiscal	Using the tax system to reduce or increase the financial cost	Increasing duty or increasing anti-smuggling activities
Regulation	Establishing rules or principles of behaviour or practice	Establishing voluntary agreements on advertising
Legislation	Making or changing laws	Prohibiting sale or use
Environmental/ social planning	Designing and/or controlling the physical or social environment	Using town planning
Service provision	Delivering a service	Establishing support services in workplaces, communities etc.

[1]Capability beyond education and training; opportunity beyond environmental restructuring


Sources of behaviour
Intervention functions
Policy categories
Guidelines
Environmental/ Social planning
Communication/ Marketing
Legislation
Service provision
Regulation
Fiscal measures
Restrictions
Education
Persuasion
Incentivisation
Coercion
Training
Enablement
Modelling
Environmental restructuring
CAPABILITY
OPPORTUNITY
MOTIVATION
Physical
Social
Psychological
Physical
Automatic
Reflective

limitations to the research

- First, it is possible that the systematic review missed important frameworks and/or intervention functions.
- Second, judgement is inevitably involved in conceptualising intervention functions and policy categories. There are many different ways of doing this, and no guarantees that the one arrived at here is optimal. Indeed, different frameworks may be more or less useful in different circumstances.
- Third, even though the proposed framework appears to be comprehensive and can be used reliably to characterise interventions, it is possible that it may prove difficult to use. However, the systematic way in which development of the BCW has been approached should enable it to provide a more robust starting point for development of improved frameworks than has hitherto been possible.


با تشکر