Aims

- Developing effective and replicable interventions based on our best current knowledge
- Recording and reporting the decision making process in developing the intervention
- Theorising how the theory affects behaviour and other outcomes
- Understanding how interventions works
MRC framework for development and evaluation of complex interventions

Cumulative knowledge base

What are the key components of behaviour interventions?
Features of Complex Behaviour Change interventions

• **Behaviour change techniques** (BCTs), e.g., prompt goal setting or self-monitoring of behaviour

• **Modes of delivery**, e.g., individual vs. group delivery; intensity, duration, technology use, materials, facilitator variables, etc

• **Theory**: theoretical mediators, rationale for combining elements, cover story of intervention

• **Procedural and clinical features**: e.g., techniques and features to establish rapport, adherence, communication and fidelity as well as facilitator skills, features and training.

Abraham & Michie, 2008; Hardeman et al., 2002; Araújo-Soares et al., 2009; French et al (submitted)
A Matrix Approach to Intervention Development

- These features can be combined in various ways creating a complex orthogonal matrix of possible interventions.
- This leaves considerable degrees of freedom to intervention developers how to define and combine these features.
- Intervention development can be understood as an iterative selection process out of the possible combinations within this matrix.
**Definition Intervention Development**

- Intervention development is the structured process of selecting and combining sets of a) behaviour change techniques, b) modes of delivery, c) theoretical assumptions and d) procedural and clinical features based on evidence, theory and/or other explicit rationales.

- The number of decisions made in the development process and the rationale for these decisions should be made explicit.

- The conclusiveness of these decisions depends on the quality of the evidence base and the reporting of interventions in trials.

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Abraham & Michie, 2008; Hardeman et al., 2002; Araújo-Soares et al., 2009; French et al (submitted)
### Behaviour change techniques: reliable taxonomy

to change physical activity and healthy eating behaviours

1. General information
2. Information on consequences
3. Information about approval
4. Prompt intention formation
5. Specific goal setting
6. Graded tasks
7. Barrier identification
8. Behavioral contract
9. Review goals
10. Provide instruction
11. Model/demonstrate
12. Prompt practice
13. Prompt monitoring
14. Provide feedback
15. General encouragement
16. Contingent rewards
17. Teach to use cues
18. Follow up prompts
19. Social comparison
20. Social support/change
21. Role model
22. Prompt self talk
23. Relapse prevention


### Features of Complex Behaviour Change interventions

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*Abraham & Michie, 2008; Hardeman et al., 2002; Araújo-Soares et al., 2009; French et al (submitted)*
Modes of delivery

- Face to face vs. telephone vs. online
- Group vs. single intervention
- Nurse delivered vs. GP delivered
- Home based vs. hospital based
- Use of materials
- Duration, intensity, frequency, lengths etc.
- Qualification of facilitator
- Etc, etc, etc

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Abraham & Michie, 2008; Hardeman et al., 2002; Araújo-Soares et al., 2009; French et al (submitted)
Determinants of health

- General socio-economic, cultural and environmental conditions
- Social and community networks
- Individual lifestyle factors
- Living and working conditions
- Unemployment
- Education
- Work environment
- Agriculture and food production
- Water and sanitation
- Housing
- Unemployment
- Health care services

Define outcomes and mediators

Intervention (at any level)

Behavioral determinants (e.g. cognitive, social, geographical)

Behaviour

Physiological & biochemical variables

Health outcomes (health and quality of life)

Define behavioural outcomes in accordance to the TACT principle

Target  Action  Context  Time

Hardeman, Sutton, Griffin, Johnston, White, Wareham & Kinmonth, 2005; Ajzen, 2006
Which theories? Theories explain..

- **Why** – what determines behaviour
- **Who** – is likely to do behaviour
- **How** - to change behaviour

Motivation ⇔ Intention ⇔ Planning ⇔ Action ⇔ Behaviour

Choosing a theoretical approach

*many theories of behaviour*

- 33 theories and 128 constructs generated
- In four overlapping areas:
  - motivation
  - action
  - organisation
  - behaviour change
- Simplified into 12 domains of theoretical constructs
- Interview questions associated with each domain

Motivation theories
explain why people want to do things

- Theory of Planned Behaviour
- Theory of Reasoned Action
- Protection Motivation Theory
- Health Belief Model
- Social Cognitive Theory
- Locus of control theories
- Social Learning Theory
- Social Comparison Theory
- Cognitive Adaptation Theory
- Social Identity Theory
- Elaboration Likelihood Model
- Goal Theories
- Intrinsic Motivation Theories
- Self-determination theory
- Attribution Theory
- Decision making theories (e.g. social judgment theory, “fast and frugal” model, systematic vs. heuristic decision making)
- Fear arousal theory

Action theories
explain why people do things

- Learning theory
- Operant theory
- Modelling
- Self-regulation theory
- Implementation theory/automotive model
- Goal theory
- Volitional control theory
- Social cognitive theory
- Cognitive Behaviour therapy
- Transtheoretical model
- Social identity theory
Organisation theories explain how groups and organisations influence what people feel and do

- Effort-reward imbalance
- Demand-control model
- Diffusion theory
- Group theory eg. group minority theory
- Decision making theory
- Goal theory
- Social influence
- Person situation contingency models

Simplifying theory: domains of behavioural determinants

- Knowledge
- Skills
- Professional role and identity
- Beliefs about capabilities
- Beliefs about consequences
- Motivation and goals
- Memory, attention and decision processes
- Environmental context and resources
- Social influences
- Emotion
- Action plans

State of the art in intervention development

Do current conduct and reporting of behavioural interventions fall short of best practice?

- Less than half of interventions in the review reported a theoretical base for intervention development
- 33% of studies failed to provide any justification of why a particular theory had been selected
- Not a single study explained how theory led to development of an intervention and none provided a systematic rationale underpinning intervention development
- Interventions were also rarely based on evidence; only 50% provided any reference to previous research positively informing their own intervention
- This weakness in rationale often makes it impossible to determine if published interventions are based solely on common sense or on established theory and evidence.

Dombrowski et al 2007
Challenges for intervention development

• We need quality criteria not only for trials (evaluation) but also for intervention development and reporting. In particular:
  – reference to an evidence base for the techniques used to change behaviour and
  – a thorough and replicable description of the methods and techniques used in the behavioural intervention.

Systematic approaches to intervention development
Intervention Mapping Phases

1. Needs Assessment
2. Objectives
3. Methods and strategies
4. Program
5. Adoption and Implementation
6. Evaluation

Kok et al., 2002; Bartelomew et al., 2001

Step 1 Needs Assessment

- Establish a planning group that includes potential program participants and plan the needs assessment
- Conduct the needs assessment by analysing health problems and behavioural and environmental causes
- Balance a needs assessment with an assessment of community capacities
- Link the needs assessment to evaluation planning by establishing desired program outcomes
Needs Assessment - Results

Health Promotion Goals

• What behaviours do we want to promote? Among whom? How much? When?
• What environmental conditions do we like to change? Who are the key decision makers?

IM 2: Matrices of Change Objectives

• Expected change or program outcomes for health related behaviour and environmental conditions
• Subdivide behaviour and environmental conditions into performance objectives
• Identify modifiable personal and environmental determinants of risk behaviour
• Create matrices of change objectives by crossing performance objectives with determinants
Creating Matrices of Change Objectives

<table>
<thead>
<tr>
<th></th>
<th>Determinant 1</th>
<th>Determinant 2</th>
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<tbody>
<tr>
<td>Performance objective 1</td>
<td>Change objective</td>
<td>Change objective</td>
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<tr>
<td>Performance objective 2</td>
<td>Change objective</td>
<td>Change objective</td>
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</tbody>
</table>

IM 3 Methods and Strategies

- Identify relevant theory identifying possible mediators/determinants of change
- Identify techniques to modify these determinants and conditions under which they are most effective
- Involve users when choosing methods and strategies
- Select or design modes of delivery
IM 4 Producing Program Components

- Involve users in intervention design, secure acceptability and feasibility
- Specify elements and sequence of ingredients
- Prepare materials
- Pre-test program for acceptability and feasibility

IM 5 Planning for Adoption and Implementation

- Identify users of the program
- Write and test intervention manual
- Specify performance objectives for adoption, implementation and sustainability
- Specify determinants of adoption behaviours: e.g., behaviour of health professionals
- Repeat procedures for these behaviours
IM 6 Planning for Evaluation

- Identify primary and secondary outcomes (determinants, behaviour, physiology, health – see Hardemann model)
- Fidelity (is the intervention faithfully delivered as specified in the manual).
- Specify measurable outcomes.

PRECEDE/PROCEED Model
Using Theory to Identify Behaviour Change Techniques

- The use of behaviour change theories such as the Model of Action Phases, Self-Regulation Theory, and Social Cognitive Theory has direct implications for the selection of behaviour change techniques. For example, basing an intervention on the Model of Action Phases would imply the use of action planning as an intervention technique.

- However, many theories emphasizing cognitive variables (e.g. social cognition models) do not necessarily specify methods and techniques to change hypothesized theoretical determinants. In other words, they lend themselves better to identifying targets for intervention (the mediation approach), than they do to identifying intervention techniques.

Hardeman et al., 2002; Sniehotta, 2009; Webb et al (submitted)
Theory based interventions

Theories of behavior change can inform interventions by
(1) suggesting techniques to change behaviour or the identified cognitive, environmental or social targets.
(2) identifying targets for intervention and/or

Theory Based Approach 1: Applying behaviour change theories suggesting BCTs
Theories of **How** to change behaviour

- Self-Regulation
- Operant Learning
- Social Cognitive

**3 theories which not only explain behaviour, but**
- explain *how to change* behaviour
- have *evidence of changing behaviour*

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**Action Control**

**Self-regulation theory**

**CHANGE BEHAVIOUR** by
- Goal setting
- Self-Monitoring
- Comparison
- Effort to reduce discrepancy

![Diagram](Image)

Social Cognitive Theory (Bandura)

CHANGE BEHAVIOUR by changing self-efficacy by:
- Mastery experience
- Verbal persuasion
- Vicarious experience
- Physiological attributions


Operant Learning Theory (Skinner)

CHANGE BEHAVIOUR by changing antecedents and/or consequences

A → B → C

Antecedents → Behaviour → Consequences
- e.g. environment
- e.g. reward/punishment

http://www.bfskinner.org/Operant.asp
Behaviour change techniques from OLT

Techniques directly related to OLT

• Positive reinforcement
• Reward
• Punishment
• Extinction
• Negative reinforcement
• Vicarious reinforcement

fundamentals of reward/punishment

• Differential reinforcement
• Reinforcement of alternative behaviour
• Stimulus generalisation
• Stimulus narrowing
• Shaping
• Chaining
• Thinning
• Token economy
• Habit reversal

Theory Based Approach 2: Modifying Theoretical Mediators
Using Theory to develop an intervention

Choosing a Theoretical Approach

Predictive Modelling

Intervention development:
Modes of delivery
acceptability

Johnston, 2008

The mediation approach

- **Step one:** Identification of key constructs within the SCM, e.g. by literature review of research conducted using the TPB to identify constructs to target,
- **Step two:** Identification of features and conditions influencing the target construct, e.g. understanding the underlying beliefs and cognitions determining the target construct
- **Step three:** Identification and development of change techniques and intervention strategies most effective in changing these constructs.
- **Step four:** Identification of theory-external procedures and techniques addressing open questions, shortcomings and gaps in the main theory, drawing on other established related theories and utilise evidence and knowledge from overlapping theories.
- **Step five:** Refinement of specific strategies to change behaviour, including pilot work to optimise the acceptability of the resultant draft intervention.

French et al. (submitted); Darker et al. (in press); Araújo-Soares et al (2009)
<table>
<thead>
<tr>
<th>Technique for behaviour change</th>
<th>Social/Professional role &amp; identity</th>
<th>Knowledge</th>
<th>Skills</th>
<th>Beliefs about capabilities</th>
<th>Beliefs about consequences</th>
<th>Motivation &amp; goals</th>
<th>Memory, attention &amp; decision processes</th>
<th>Environment &amp; context &amp; resources</th>
<th>Social influences</th>
<th>Emotion</th>
<th>Action planning</th>
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<td>Increasing skills: problem solving; decision making; goal setting</td>
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<td>Stress management</td>
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Evidence and Theory Based Constraints

- Primary goal of the intervention development process is to add constraints to the matrix, e.g., define values for rows, columns and cells of the matrix or – in other words – decide on the features that the intervention should or should not have based on our current knowledge
- Evidence and/or theory will suggest or rule out several features
- For some features, the knowledge based might be insufficient to make a conclusive decision

Rationales

- Evidence about effectiveness
- Evidence about acceptability and feasibility
- Theory
- Available resources and skills
- Economy
- Others?

➔ Important to realise that not all decisions (cells in the matrix) can be made on any of those rationales and consequently, the constrained matrix is incomplete leaving additional decisions open
Iterations

- Iterations are based on the initial constraints
- Additional features are introduced coherent to the constraints made before
- Criteria are:
  - theoretical coherence
  - Procedural coherence and feasibility
  - Experience and available skills
- For each step in the iterative process the decision are more based on coherence to what has already been included and the rationale for decisions becomes more pragmatic.

Theory based interventions from a matrix perspective

- ‘The idea of a theoretically "pure" intervention is a chimera. (French et al, submitted)’
- Many different interventions can be derived from the same theory
- For the majority of decisions about intervention features, the respective behaviour change theory will not offer guidance
- Instead, these decisions will be made introducing other related theories and theoretical assumptions for e.g., regarding communication, perception, memory, psychometrics, etc.
- These are reflected in the findings and it is possible that tests of the same theory show different results depending on the theoretical and methodological embedding of the theory.
- Theory testing is a multi-theory-multi method endeavour.
How replicable are behavioural interventions for health professionals?

- N=25 health professionals (doctors, psychologists, social scientists and allied health professionals at the 1st UK behavioural medicine conference) were asked to rate their confidence of being able to replicate either the pharmacological (n=13) or the behavioural (n=12) intervention from the published descriptions of two major trials testing the effects of interventions on diabetes prevention (DPP, 2002; Tuomilehto et al., 2001).

References

Diabetes Prevention Program Research Group. Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin. NEJM 2002; 346: 393-403.


Sniehotta, Michie & Johnston (2005)