Translating evidence into practice: the role of behaviour change

Susan Michie
Professor of Health Psychology
Director of Centre for Behaviour Change
University College London

Imparts, February 2015
Translating evidence into practice: the gaps

- **Basic science to promising application**
  - "can it work?: efficacy
  - 1st gap

- **Promising to clinical application**
  - "does it work in practice?: effectiveness
  - 2nd gap

- **Research trials to clinical practice**
  - "is it routinely delivered as it should be?: implementation
  - 3rd gap

- **Patient/public engagement**
  - "does it work in practice?: uptake
  - 4th gap
Evidence of good practice ....

• We have good evidence for effective interventions
  – considerable investment in
    • trials of healthcare interventions, and
    • evidence syntheses (e.g. Cochrane, NICE)
• Much of that investment is avoidably wasted because research evidence is not
  – reported well
  – implemented effectively

Illustration of the problem: behavioural support for smoking cessation

- <50% of behaviour change techniques specified in protocols are reported – Lorencatto et al, 2012, *N&TR*
- <50% of behaviour change techniques specified in protocols are delivered – smoking, Lorencatto et al, 2013 *J Cons & Clin Psy*
- physical activity, Hardeman et al, 2008, *Psy & Health*

Therefore, there may be no correspondence between published reports and interventions actually delivered.
Improve …

1. Reporting
   – of intervention characteristics **in sufficient detail** in protocols and publications to allow effective implementation, replication and evidence synthesis

2. Implementation/fidelity
   – Assess the extent to which interventions are delivered as stated in protocols and investigate reasons
   – Analyse the problem in terms of **behaviour**

3. Use of **frameworks/theory** in development and evaluation
Interventions are complex

• Several, potentially interacting, techniques
• Vary in
  – **content** or elements of the intervention
  – **delivery** of the intervention
    • the **mode of delivery** (e.g., face-to-face)
    • the **intensity** (e.g., contact time)
    • the **duration** (e.g., number sessions over a given period)
    • characteristics of **those delivering** the intervention
    • characteristics of the **recipients**, 
    • characteristics of the **setting** (e.g., worksite)
  – **adherence** to delivery protocols

Better reporting of interventions: the Template for Intervention Description and Replication (TIDieR) checklist and guide  *BMJ* 2014

Tammy Hoffmann         Paul Glasziou         Isabelle Boutron         Ruairidh Milne
Rafael Perera          David Moher           Doug Altman             Virginia Barbour
Helen MacDonald         Marie Johnston        Sarah E Lamb            Mary Dixon-Woods
Peter McCulloch        Jeremy Wyatt          An-Wen Chan             Susan Michie
### Example of the problem: Descriptions of “behavioural counselling” in two interventions

<table>
<thead>
<tr>
<th>Title of journal article</th>
<th>Description of “behavioural counseling”</th>
</tr>
</thead>
<tbody>
<tr>
<td>The impact of <em>behavioral counselling</em> on stage of change fat intake, physical activity, and cigarette smoking in adults at increased risk of coronary heart disease</td>
<td>“educating patients about the benefits of lifestyle change, encouraging them, and suggesting what changes could be made” (Steptoe et al. <em>AJPH</em> 2001)</td>
</tr>
<tr>
<td>Effects of internet <em>behavioral counselling</em> on weight loss in adults at risk for Type 2 diabetes</td>
<td>“feedback on self-monitoring record, reinforcement, recommendations for change, answers to questions, and general support” (Tate et al. <em>JAMA</em> 2003)</td>
</tr>
</tbody>
</table>
Biomedicine vs behavioural science …
example of smoking cessation effectiveness

Varenicline  *JAMA, 2006*

- **Intervention content**
  - Review smoking history & motivation to quit
  - Help identify high risk situations
  - Generate problem-solving strategies
  - Non-specific support & encouragement

- **Mechanism of action**
  - Activity at a subtype of the nicotinic receptor where its binding produces agonistic activity, while simultaneously preventing binding to a4b2 receptors

---

Behavioural counselling  *Cochrane, 2005*

- **Intervention content**
  - None mentioned

- **Mechanism of action**
  - None mentioned
How to describe “content” or the “what” of behavioural interventions?

• Need an agreed, standard method of describing interventions

• Must be accessible and supported across
  – disciplines and countries
  – behaviours and contexts
A methodology: describe content in terms of behaviour change techniques (BCTs)

• “Active ingredients” within the intervention designed to change behaviour

• They are
  – observable,
  – replicable and
  – discrete, low-level components of an intervention that on their own have potential to change behaviour

• Can be used alone or in combination with other BCTs
An early reliable taxonomy to change frequently used 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. Behavioural 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
24. Stress management
25. Motivational interviewing
26. Time management

Involves detailed planning of what the person will do including, at least, a very specific definition of the behaviour e.g., frequency (such as how many times a day/week), intensity (e.g., speed) or duration (e.g., for how long for). In addition, at least one of the following contexts i.e., where, when, how or with whom must be specified. This could include identification of sub-goals or preparatory behaviours and/or specific contexts in which the behaviour will be performed.

The person is asked to keep a record of specified behaviour/s. This could e.g. take the form of a diary or completing a questionnaire about their behaviour.

Abraham & Michie, 2008, *Health Psychology*
“Taxonomies” of BCTs

• Physical activity/healthy eating/mixed: 26 BCTs
  Abraham & Michie, 2008

• Physical activity & healthy eating: 40 BCTs
  Michie et al, Psychology & Health, 2011

• Smoking cessation: 53 BCTs
  Michie et al, Annals Behavioral Medicine, 2010

• Reducing excessive alcohol use: 42 BCTs
  Michie et al, Addiction, 2012

• Condom use: 47 BCTs
  Abraham et al, 2012

• General behaviour change: 137 BCTs

• Competence framework: 89 BCTs
  Dixon & Johnston, 2011

Fragmentation rather than integration
The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions

Susan Michie, DPhil, CPsychol · Michelle Richardson, PhD · Marie Johnston, PhD, CPsychol · Charles Abraham, DPhil, CPsychol · Jill Francis, PhD, CPsychol · Wendy Hardeman, PhD · Martin P. Eccles, MD · James Cane, PhD · Caroline E. Wood, PhD

© The Society of Behavioral Medicine 2013

Abstract

Background CONSORT guidelines for reporting of behavior change trials have increased awareness of the need for transparent descriptions of behavior change techniques (BCTs) used in interventions. This resulted in 93 BCTs clustered into 16 groups.

Objectives To conduct an extensive taxonomy of BCTs.

Methods Experts rated 124 BCTs from six published classification systems. Another 18 experts grouped BCTs.

Conclusions “BCT taxonomy v1,” an extensive taxonomy of 93 consensually agreed, distinct BCTs, offers a step change as a method for specifying interventions, but we anticipate further development and evaluation based on international, interdisciplinary consensus.

Electronic supplementary material The online version of this article (doi:10.1007/s12160-013-9486-6) contains supplementary material, which is available to authorized users.

S. Michie (✉) · M. Johnston · C. E. Wood
Centre for Outcomes Research Effectiveness,
Research Department of Clinical, Educational and Health Psychology,
University College London, 1-19 Torrington Place,
London WC1E 7HB, UK
e-mail: s.michie@ucl.ac.uk

J. Francis
Division of Health Services Research & Management,
City University London,
C332 Tait Building, City University London, Northampton Square,
London EC1V 0HB, UK

W. Hardeman
Behavioural Sciences Group, The Primary Care Unit,
Department of Public Health, Maastricht University Medical Centre,
5211 LE Maastricht, The Netherlands

M. Richardson
National Centre for Mental Health Research and Evaluation,
2 St John’s Wood Terrace, Acton, London W3 8HL, UK

M. Eccles
Institute of Public Health, University of Cambridge,
Downing Site, Downing Street, CB2 2QQ, Cambridge, UK

M. Johnston
Centre for Outcomes Research Effectiveness,
Research Department of Clinical, Educational and Health Psychology,
University College London, 1-19 Torrington Place,
London WC1E 7HB, UK

C. E. Wood
Centre for Outcomes Research Effectiveness,
Research Department of Clinical, Educational and Health Psychology,
University College London, 1-19 Torrington Place,
London WC1E 7HB, UK

e-mail: s.michie@ucl.ac.uk
BCT Taxonomy v1: 93 items in 16 groupings

<table>
<thead>
<tr>
<th>Page</th>
<th>Grouping and BCTs</th>
<th>Page</th>
<th>Grouping and BCTs</th>
<th>Page</th>
<th>Grouping and BCTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Goals and planning</td>
<td>8</td>
<td>6. Comparison of behaviour</td>
<td>16</td>
<td>12. Antecedents</td>
</tr>
<tr>
<td></td>
<td>1.1. Goal setting (behavior)</td>
<td></td>
<td>6.1. Demonstration of the behavior</td>
<td></td>
<td>12.1. Restructuring the physical</td>
</tr>
<tr>
<td></td>
<td>1.2. Problem solving</td>
<td></td>
<td>6.2. Social comparison</td>
<td></td>
<td>environment</td>
</tr>
<tr>
<td></td>
<td>1.3. Goal setting (outcome)</td>
<td></td>
<td>6.3. Information about others’</td>
<td></td>
<td>12.2. Restructuring the social</td>
</tr>
<tr>
<td></td>
<td>1.4. Action planning</td>
<td></td>
<td>approval</td>
<td></td>
<td>environment</td>
</tr>
<tr>
<td></td>
<td>1.5. Review behavior goal(s)</td>
<td></td>
<td></td>
<td></td>
<td>12.3. Avoidance/reducing exposure</td>
</tr>
<tr>
<td></td>
<td>1.6. Discrepancy between current</td>
<td></td>
<td></td>
<td></td>
<td>to cues for the behavior</td>
</tr>
<tr>
<td></td>
<td>behavior and goal</td>
<td></td>
<td></td>
<td></td>
<td>12.4. Distraction</td>
</tr>
<tr>
<td></td>
<td>1.7. Review outcome goal(s)</td>
<td>9</td>
<td>7. Associations</td>
<td></td>
<td>12.5. Adding objects to the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.1. Prompts/cues</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Label</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Goal setting (behavior)</td>
<td>Set or agree on a goal defined in terms of the behavior to be achieved</td>
<td>Agree on a daily walking goal (e.g. 3 miles) with the person and reach agreement about the goal</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Note: only code goal-setting if there is sufficient evidence that goal set as part of intervention; if goal unspecified or a behavioral outcome, code 1.3, Goal setting (outcome); if the goal defines a specific context, frequency, duration or intensity for the behavior, also code 1.4, Action planning</em></td>
<td>Set the goal of eating 5 pieces of fruit per day as specified in public health guidelines</td>
</tr>
</tbody>
</table>
The BCTTv1 smartphone app

- Fully searchable version of BCTTv1
- Search by BCT label, BCT grouping or alphabetically
- Increases familiarity with the taxonomy
- Increases speed and recall of BCT labels and definitions

* You'll need an internet connection to use the app
Welcome

The Behaviour Change Technique Taxonomy – a resource for intervention designers, researchers, practitioners, systematic reviews and all those wishing to communicate the content of behaviour change interventions.

Login

New User?

email

password

login

Tasks and session materials made a great combination

Tutorial trainee, Cambridge UK

www.bct-taxonomy.com
Improve …

1. Reporting
   – of intervention characteristics in sufficient detail in protocols and publications to allow effective implementation, replication and evidence synthesis

2. Implementation
   – Assess the extent to which interventions are delivered as stated in protocols and investigate reasons
   – Analyse the problem in terms of behaviour

3. Use of frameworks/theory in development and evaluation
Improving implementation: Changing behaviour

• Define implementation in terms of behaviour
  – Who needs to do what, when, where and how

• Analyse why implementation is poor
  – in behavioural terms
  – as a basis of developing the intervention

• Draw on the science of behaviour change
  – evidence-based theories and techniques of behaviour change
Example of using BCT approach

• “Proactive”: Intervention to increase physical activity of those at risk of Type 2 diabetes
• Assess fidelity of delivery
• Evaluate mechanisms of action
  – By linking intervention content to theory


The intervention: 14 behaviour change techniques

- Delivered by trained professionals in 5 sessions over 12 months
- Specified in detailed protocols/manuals
- An RCT of 365 people, family history & sedentary
  - Increased activity by equivalent of 20 minutes per day
  - No difference between intervention and “control” groups

How much of the intervention was delivered? How did the intervention change behaviour?

- 27 participants selected to study in depth
- Tape recorded and transcribed sessions
- All discussion in sessions relevant to behaviour change was reliably coded into techniques and theories
  - Both of professionals and of participants
Intervention techniques

1. Give information
2. Elicit questions
3. Summarise message
4. Set goals
5. Self-monitor
6. Build motivation
7. Action plans
8. Use prompts
9. Use rewards
10. Build support
11. Review goals
12. Build habits
13. Relapse prevention
14. Generalise skills

Theories

1. Theory of Planned Behaviour
2. Relapse Prevention Theory
3. Self-regulation Theory
4. Operant Learning Theory
The implementation process

Theories of behaviour change

Techniques in manual

Delivery of techniques by professional

Participant response to intervention

Physical activity
Percentage of techniques delivered by professionals

45%
Variation in implementation

Sessions: p<0.001 (Page test)

Facilitators: p<0.001 (Kruskal-Wallis test)
Theory: MRC Guidance for developing and evaluating complex interventions

Craig et al, 2009 BMJ

Feasibility and piloting
- Testing procedures
- Estimating recruitment and retention
- Determining sample size

Development
- Identifying the evidence base
- Identifying or developing theory
- Modelling process and outcomes

Evaluation
- Assessing effectiveness
- Understanding change process
- Assessing cost effectiveness

Implementation
- Dissemination
- Surveillance and monitoring
- Long term follow-up
How were techniques distributed over the theories? (a) in protocol (b) delivered
Process linking theory and behaviour change

Theories of behaviour change

Techniques in manual

Delivery of techniques by professional

Participant response to intervention

Physical activity
How was (a) professional (b) participant talk about behaviour distributed over the theories?
Which theories best accounted for change?

Although *Self-regulation theory* is the basis of the most commonly delivered intervention techniques, *Operant learning theory* may be a better explanation for behaviour change among participants.
Designing effective interventions

1. Understand the behaviour you are trying to change
   – Make a “behavioural diagnosis”
2. Consider the full range of options open to you
3. Use a systematic method for selecting behaviour change techniques
1. Define problem in behavioural terms
2. Select target behaviour (what you will change to address the problem)
3. Specify target behaviour (what, where, when, how, with whom, in what context...)
4. Understand what needs to change to achieve target behaviour (COM-B and TDF)

**Design intervention**

Identify:
5. Intervention functions
6. Behaviour Change Techniques

**Deliver intervention**

Select:
7. Mode of delivery
8. Policy categories
Understand the behaviour in context

- **Why** are behaviours as they are?
- **What needs to change** for the desired behaviour/s to occur?

- Answering this is helped by a model of behaviour
  - COM-B
The COM-B model: Behaviour occurs as an interaction between three necessary conditions

- **Capability**: Psychological or physical ability to enact the behaviour
- **Motivation**: Reflective and automatic mechanisms that activate or inhibit behaviour
- **Opportunity**: Physical and social environment that enables the behaviour

Michie et al (2011) *Implementation Science*
Intervening: Consider the full range of options

• Need a framework that is
  – Comprehensive
    • So don’t miss options that might be effective
  – Coherent
    • So can have a systematic method for intervention design
  – Linked to a model of behaviour
    • So that can draw on behavioural science

Useable by, and useful to, policy makers, service planners and intervention designers
Do we have such a framework?

• Systematic literature review identified 19 frameworks of behaviour change interventions
  – related to health, environment, culture change, social marketing etc.
• None met all these three criteria
• So …. Developed a synthesis of the 19 frameworks

The Behaviour Change Wheel

- Synthesis Identified 9 intervention functions and 7 policy categories

- Linked to a model of behaviour – COM-B
  - Forms the hub of the ‘wheel’

Michie et al (2011) *Implementation Science*
Understand target behaviour

1. Define problem in behavioural terms
2. Select target behaviour (what you will change to address the problem)
3. Specify target behaviour (what, where, when, how, with whom, in what context...)
4. Understand what needs to change to achieve target behaviour (COM-B and TDF)

Design intervention

Identify:

5. Intervention functions
6. Behaviour Change Techniques

Deliver intervention

Select:

7. Mode of delivery
8. Policy categories
Behaviour at the hub .... COM-B

- Sources of behaviour
- Intervention functions
- Policy categories
Use rules to reduce the opportunity to engage in the behaviour

Increase knowledge or understanding

Use communication to induce positive or negative feelings to stimulate action

Create an expectation of reward

Create an expectation of punishment or cost

Impart skills

Increase means or reduce barriers to increase capability (beyond education or training) or opportunity (beyond environmental restructuring)

Provide an example for people to aspire to or emulate

Change the physical or social context
Making or changing laws

Establishing rules or principles of behaviour or practice

Creating documents that recommend or mandate practice. This includes all changes to service provision

Designing and/or controlling the physical or social environment

Using the tax system to reduce or increase the financial cost

Using print, electronic, telephonic or broadcast media

Delivering a service

Making or changing laws
Designing interventions

• There are >93 BCTs

• Given intervention functions and policies,
  – which behaviour change techniques (BCTs) to select?
# The APEASE criteria

<table>
<thead>
<tr>
<th><strong>Affordability</strong></th>
<th>Can it be delivered to budget?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Practicability</strong></td>
<td>Can it be delivered as designed and, if appropriate, at scale?</td>
</tr>
<tr>
<td><strong>Effectiveness/cost-effectiveness</strong></td>
<td>Does it work (ratio of effect to cost)?</td>
</tr>
<tr>
<td><strong>Acceptability</strong></td>
<td>Is it judged appropriate by relevant stakeholders (publicly, professionally, politically)? And where relevant, is it engaged with?</td>
</tr>
<tr>
<td><strong>Side-effects/safety</strong></td>
<td>Does it have any unwanted side-effects or unintended consequences?</td>
</tr>
<tr>
<td><strong>Equity</strong></td>
<td>Will it reduce or increase the disparities in health/wellbeing/standard of living?</td>
</tr>
</tbody>
</table>
Use this framework to …

1. **Design** interventions and policies
   - COM-B links to intervention functions link to BCTs
2. “Retrofit” – **identify** what is in current interventions and policies
3. **Provide a framework for evaluation**
   - How are interventions working?
4. **Structure systematic reviews**

www.behaviourchangewheel.com
Some applications of Behaviour Change Wheel

**India**
- Smartphone app to reduce cardiovascular disease risk

**Kenya**
- Improve paediatric health care

**Netherlands**
- An organisational intervention tool

**Thailand**
- Preventing melioidosis

**USA**
- Improving colorectal cancer screening
- Providing long-acting reversible contraception to adolescents
- Improve parenting practices for children with challenging behaviour

**UK**
- Smartphone app for parents of overweight children
- Promote recycling behaviours in university staff and students
- Reduce cardiovascular disease risk in people with severe mental illness
- Improve management of postnatal depression
- Smartphone app to promote attentive eating
- Internet intervention to promote condom use

**Papua New Guinea**
- Change Betel nut chewing behaviour

**International Red Cross**
- Train volunteers
Summary

- Implementing evidence based practice depends on behaviour change
- Interventions have been only moderately effective and have largely not been informed by behavioural science
- The field of evidence based practice would be advanced by improving
  - Better methods for specifying interventions
  - Ensuring good fidelity of delivery
  - Theoretical understanding of behaviour
Acknowledgements

• Key collaborators in this work
  – Prof Robert West, University College London
  – Prof Marie Johnston, University of Aberdeen
  – UCL Health Psychology Research Group

• Funders

[Images of people and logos]
For more information

- Susan Michie  
  - s.michie@ucl.ac.uk

- Books  
  - www.behaviourchangewheel.com
  - www.behaviourchangetheories.com

- UCL Centre for Behaviour Change  
  - www.ucl.ac.uk/behaviour-change
  - Summer School 2015